



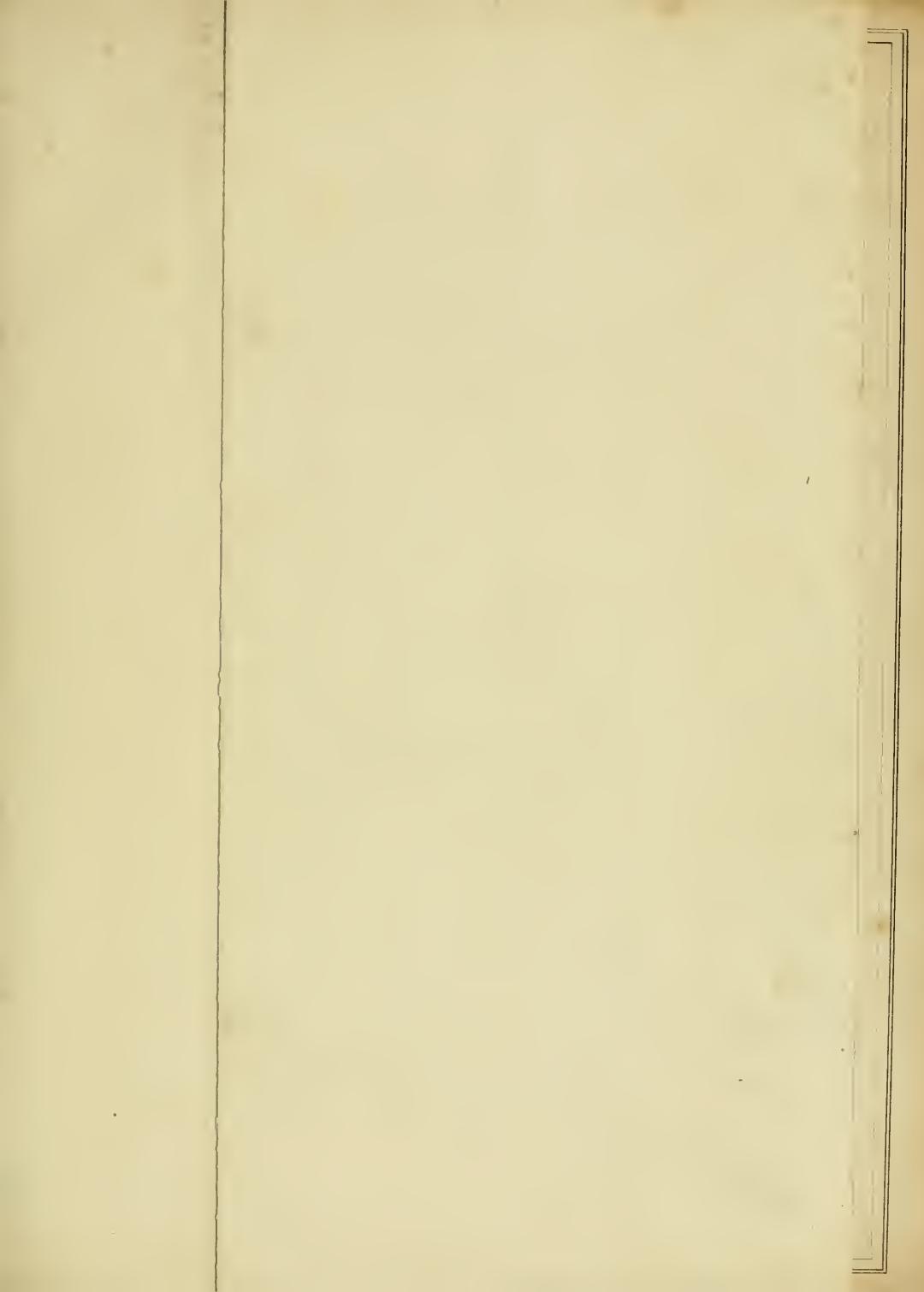


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A

HAND BOOK FOR Plain and Ornamental MAPPING, AND ENGINEERING DRAWING,

CONSISTING OF EVERY STYLE OF EMBELLISHMENT AND WRITING

USED BY

S U R V E Y O R S

AND

CIVIL & MECHANICAL ENGINEERS;

CONTAINING MANY ORIGINAL DESIGNS AND SKETCHES FOR HILLS, TREES, CLIFFS, ROCKS, NORTH-POINTS,
SCROLLS, BORDERS, & TITLES FOR ESTATE & PARISH MAPS, RAILWAY PLANS, AND SECTIONS, AND
EVERY DESCRIPTION OF ORNAMENT REQUIRED IN THE ABOVE PROFESSIONS.

BY

BENJAMIN P. WILME,
Civil-Engineer & Surveyor.

L O N D O N .

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1841.

A

HAND-BOOK FOR MAPPING, ENGINEERING, AND ARCHITECTURAL DRAWING,

IN WHICH

MAPS OF ALL DESCRIPTIONS ARE ANALYZED, AND THEIR SEVERAL USES FULLY EXPLAINED.

INTENDED FOR THE USE OF

Civil Engineers, Architects, and Surveyors;

ALSO

FOR NAVAL AND MILITARY ACADEMIES, ENGINEERING SCHOOLS AND COLLEGES,
AND DRAUGHTSMEN.

ILLUSTRATED WITH

FORTY-THREE LARGE PLATES AND THIRTY-NINE WOODCUTS,

AMONG WHICH WILL BE FOUND

EXAMPLES OF A PARLIAMENTARY RAILWAY PLAN, SECTION, AND CROSS SECTIONS,

PREPARED IN COMPLIANCE WITH THE STANDING ORDERS OF THE HOUSE OF COMMONS;

WITH PLAIN INSTRUCTIONS FOR

LITHOGRAPHING AND ZINCOPRINTING MAPS AND DRAWINGS, AND AN EXPOSITION OF THE
RELATIVE COST AND MERITS OF ENGRAVING, LITHOGRAPHING,
AND ZINCOPRINTING.

BY B. P. WILMIE,

CIVIL ENGINEER AND SURVEYOR,

AUTHOR OF "A MANUAL OF WRITING AND PRINTING CHARACTERS," ETC.

ADEO IN TENERIS CONSUESCERE MULTUM EST.—VIRGIL.

LONDON :

PUBLISHED FOR THE AUTHOR,

BY JOHN WEALE, 59, HIGH HOLBORN.

1846.

INTRODUCTION.

THE objects of this book are of a twofold nature, viz., 1st, to enable teachers and learners of map drawing, architectural and engineering drawing, to acquire and impart a knowledge of the art by an easier and less tedious route than has hitherto been opened to them; and 2ndly, to be used as a book of occasional reference for the established practitioner. By teachers and learners it is hoped the different subjects will be found to be familiarly treated. The draughtsman may also consult its pages and numerous illustrations with advantage. The circulation the work has already had, in its unfinished state, fully satisfies the author that his labours have not been uncalled for. The increased demand for maps has of late years been so great as to produce an enormous influx of engineers, surveyors, and draughtsmen. Many persons have even forsaken other and profitable occupations to embrace one now so popular. The Ordnance surveys of England, Wales, and Ireland have called many into the field; next the tithe survey, and the numerous railway schemes brought before Parliament of late years, have also tended to increase the number very considerably. Many persons who have joined the ranks from a mere desire to procure employment—without having received any previous instruction, and fancying that they should have little or no trouble in treading what is in reality a rugged path—have found their mistake in due season. A strange notion seems to prevail that nothing is easier than to become an engineer or surveyor. People fancy that it is little more than *mere drawing*; and most persons indulge themselves with the belief that they can *at least do this part*. The same persons very likely console themselves with the reflection that (as to the calculating part) if they can work out a rule of three sum, having learned that at school, they can surely enter on any other calculation with equal facility. “*As to the field work it may be desirable to have a month's practice, but it is most likely that a fortnight's training will suffice.*” Such are a few of the observations frequently offered by those who would take the profession by storm. As the author does not profess to teach either the necessary calculations or field work, neither the science or practice of engineering or surveying in this book—he has no remark to make relative to those pursuits, further than to state it, as not only his

Objects of this work.

Increase of Engineers and Surveyors.

Strange notions with regard to the engineering profession.

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humble belief, but also as the opinion of more experienced practitioners, that persons entertaining such pleasing ideas are not likely to find them realized. As far as surveying may be acquired from a perusal of books on the subject, the student may certainly possess himself of a goodly library *. Observing the want of a book of this description, the author has for many years devoted the little leisure time at his command to its production. It is presumed that in this volume will be found information of a truly practical nature, and such as will enable any person of ordinary capacity, and possessing a taste for such pursuits, to qualify himself to fill the situation of a draughtsman.

If we examine the maps drawn by surveyors generally, we cannot but perceive a very great difference in the execution of them; an almost total want of system is observable. With few exceptions, no general principles are adhered to; the maps so constructed have a slovenly appearance, a want of finish throughout, or an unnecessary display of finish in one or more of the component parts. It is considered necessary to offer a few general remarks on the faults usually to be found with maps constructed in this country, and afterwards to submit some observations calculated to regulate the drawing of maps by rule. Some draughtsmen are deficient in one part of drawing, some in another. Some can draw good lines, but cannot write, or form good letters; some are adepts at colouring, but cannot either draw good lines or write well; others can only write, but make a most miserable attempt at the remaining parts. And it is notorious that many draughtsmen, if occasionally required to step out of their † *particular department*, are

Faults in map drawing.

* The student of surveying is recommended to possess himself of "Williams's Practical Geodesy," published by Parker, Strand. This is an excellent work, and may be safely consulted; it is moreover a modern publication.

Inefficiency of draughtsmen to execute more than one portion of the work.

Advantage of keeping each assistant to a different branch.

Advantages of the draughtsman being complete in all that pertains to his art.

† So deficient are many draughtsmen in their profession that it is usual for each office assistant to have *his particular line*. One is an *outline draughtsman*, a second is a *writer*, a third is an *ornamental draughtsman*, whose department it is to represent the trees, rocks, water, &c., while a fourth is exclusively an *ornamental writer*. In large undertakings draughtsmen professing different branches of the same art may be employed with great advantage to the employer, for by keeping each assistant for any considerable time to his own department or particular branch, he must acquire a very great facility of execution, and will doubtless work quicker and better than he would if engaged alike on every part. The work if properly directed progresses in a systematic and expeditious manner unattainable by other means. It would be idle to repudiate this practice, which experience teaches us to appreciate and commend. There are, however, good reasons why every draughtsman should be perfect in every part of the art. Among other reasons it may be urged, 1st. That he who is able to perform the whole will always be preferred to him who can only perform a part, if only from the fact of his being able at all times to fill up a vacancy which may occur through illness or any other cause.

2nd. He will be able to take the entire management, whether for his employer or for himself.

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little better than helpless. If we inquire into the cause of this deficiency, we may readily discover that it originates in one or other of the following causes, viz., either from a want of systematic instruction having been imparted to the draughtsman, or from his being left altogether to trust to chance to *pick up what information he can*. The employing persons who are either only half instructed, or totally unskilled in the art they profess, is fraught with serious inconvenience and mischief; for should such persons be intrusted with the charge of business, the result must prove a failure; and should their employer discover their inefficiency, his time or that of a useful assistant must be sacrificed in watching and directing their movements.

Inefficiency of draughtsmen accounted for.

Military engineers and surveyors, educated in large bodies under the best instructors, and trained to base their works on fixed principles, have a very great advantage over civilians, who have to trust in a great degree to some lucky chance for receiving instruction. To persons thus excluded from an opportunity of obtaining the requisite instruction in map drawing, this book is especially recommended, in the firm belief that by them it will be found a desideratum. As youths* are not (according to the present

Mischief resulting from the employment of unskilled persons as draughtsmen.

Superior facilities afforded military surveyors and engineers for becoming good draughtsmen.

3rd. He will derive a much greater degree of satisfaction, from a consciousness of his superior usefulness, when compared with those who can only form a part.

4th. It is sometimes absolutely necessary in order to fill some particular situation.

Lithographic and zincographic draughtsmen are rarely competent to execute an entire map or drawing with any degree of excellence; it seems to be peculiarly advantageous to the employers of this class of draughtsmen, to keep each to a separate branch, as already described. Engravers are divided into different

Different classes of engravers.

* Although it is not the general practice to educate youths for the purposes named above in schools, it has nevertheless been found necessary to open classes in some large establishments for giving instruction in the first principles of architecture, civil engineering, and surveying. There is an establishment called a "COLLEGE FOR CIVIL ENGINEERS," situate at Putney, near London, where young gentlemen are liberally educated under professors of various languages, arts and sciences. Architectural, engineering, and surveying classes have also been established at "UNIVERSITY COLLEGE, LONDON, AND AT KING'S COLLEGE, LONDON." Surveyors are employed at several of our commercial schools, in and out of London, for the purpose of teaching surveying, levelling, and mapping. Numbers of individuals also announce by advertisements in the newspapers that (like the writing masters) they can insure the perfecting their pupils in the study of surveying, levelling, &c., in six or eight easy lessons. On consideration, it appears reasonable to suppose that, at the establishments named above, youths may be tolerably grounded in the elements, and thereby rendered much more useful to the masters to whom they may afterwards be apprenticed, to practically apply the theory taught them at school. Of the six or eight lesson gentry it may be well to pause before intrusting oneself or money to their tender mercies. It may be supposed that if competent to practise that which they profess to teach, they could procure a better class of employment for their time and talents, than that to be derived from their itinerant life, their principal occupation being the instructing and permitting their pupils to look through their dilapidated and antique spy glasses at (it is to be presumed) they know not what. While

Public instruction in the rudiments of Architecture, Civil Engineering, and Surveying.

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prevailing plan of education) prepared for the preliminary duties of the architect, engineer, or surveyor by their schoolmasters, it becomes necessary for them to apply themselves diligently on entering the office in which they are destined to learn their profession. Even here they will not usually find a teacher to explain to them the why and the wherefore of each particular part of their required duties. The beginner is frequently given, for the first time, a map or drawing to copy, without any further explanation or instruction, than being told to copy it. He will not unfrequently be left to himself for a week or more during the absence of his master, who, on his return, will expect to find the map or drawing copied. To the youth so situated, this book will be an acceptable companion. He will find in its pages plain practical instructions for copying maps and drawings, and for enlarging and reducing the same, with every information required, "*from the taking up the plain sheet of paper to the production of the finished drawing*," illustrated with numerous detailed examples for his guidance in the progressive steps. He will further find illustrations and explanations of the principal mathematical drawing instruments, with directions for using them.

Tracing the best method of learning to draw at first.

Progressive improvement arising from tracing.

The hand accommodates itself to the model from which it copies.

Of all the methods resorted to for acquiring a facility in drawing, that of tracing is decidedly the best and quickest medium, and should be invariably adopted at the commencement. It will be allowed by those persons who have been much in the habit of making duplicate tracings of maps, how very rapidly they proceed with the work after two or three tracings have been made from the same map, and if a sixth or twelfth copy be made, the last one, besides being done in a much shorter time than the first, will also in most cases be better executed. Now it is this progress, this gradual improvement, that the young draughtsman should aim at, and he will find that the best method he can adopt for improvement is the *tracing the works of superior draughtsmen*. This is obvious, for in making a tracing it is directly within our power to make an *exact copy* or fac-simile of the original map or drawing, from which we trace, and from constantly repeating the operation, the hand becomes in time accustomed to the formation of the different details, and fashions itself to its model. The writing and lettering in particular

drawing this picture of those who would impose upon the credulity of the public, it must be premised that many an honest man may be compelled from adverse circumstances to resort to the practice of teaching. If he be a gentleman who has himself learned his profession legitimately, he will not bring that profession into contempt by puffing of the description above alluded to. Neither will he teach for a few shillings that, which it cost himself a handsome premium to learn: in a word, the man who does it may be fairly pronounced an empiric. But of these gentrified no more—let us for the present dismiss them, with the hope that they may soon find their true level. The books on levelling recommended to the pupil are "Simms on Levelling," and "Bruff's Engineering Field Work," both of which works may be procured of Mr. Weale, 59, High Holborn.

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should be traced and retraced. It will not be going too far to say that if this method of teaching writing and drawing were universally adopted in our schools, it would be attended with complete success. But while tracing thus for practice, the beginner cannot be too cautious, as to the works or models from which he traces; *they should be the best which can be procured.* I would recommend the titles for maps and sheets of writing and lettering in this book for exercises for the learner, and in the same way the other plates may be traced. The time that this practice (without any other) should be continued must depend on the progress made by the learner. In order that he may not tire of it through the sameness of the operation, I would recommend only one or two tracings of each subject to be made; on finishing the set, the learner can repeat the operation. But let it be borne in mind by the student, that when he has so far progressed as to be able to form a free and even line, he should divest himself occasionally of the original, and try to form a line without it. The young draughtsman must, however, be content to spend a considerable time at tracing before advancing much higher; and he should remember that it may be the groundwork on which rests his future success*. The next step should be the *transferring* of these tracings in the manner described at page 43 of this work. After this process has been carefully gone through, the young draughtsman may copy on drawing paper the works of others, full directions for which will be found in the following pages. Were any stimulant required to induce the draughtsman to become proficient, it may be enough to repeat what has been already stated in the analysis of map drawing, viz., that maps are wholly composed of dots and straight and crooked lines; now the entire skill required, is the attainment of a certain facility of manipulation, in putting together in a proper manner, and in the proper relative positions, an accumulation of dots and lines, so as to form a map. The prevalence of the dot and line is as apparent in the writing, as in the drawing, and in the embellishment or ornamental part, as it is in either one or other. With reference to the faults usually existing in surveyors' maps, the following may be enumerated as some of the most flagrant, viz., 1st, An unevenness in the thickness of lines which should be of the same thickness throughout, and a certain shakiness or crookedness in lines which should be perfectly straight—as fences. 2nd. The unsightly prominence of some portion or portions of the map, possibly of a portion which should (to use an artist's phrase) *be kept down.* 3rd. The unmethodical representation of natural objects, a poverty in the writing and detail generally, some parts of it being very much over-laboured, and other parts equally neglected.

The term of probation must depend on the progress made.

Next step, copy-
ing on drawing
paper.

Enumeration of
the faults usually
existing in sur-
veyors' maps.

* It is certain that the being a good draughtsman is one of the greatest recommendations a young beginner can possess; at times it is of the greatest importance in an office to have the assistance of a person so qualified.

OBSERVATIONS CALCULATED TO REGULATE THE DRAWING OF MAPS BY RULE.

How to set the drawing pen.

OF the first of the faults pointed out above, viz., an unevenness in the thickness of lines which should be of the same thickness throughout, it is needless to state that such lines as fences should be of the same thickness through their entire length. The error arises frequently from the drawing pen being out of order, thus obliging the draughtsman to go several times over his lines to get the pen to mark; the pen, from the nibs being uneven, will only mark when held in one of the many positions in which it will be necessary to put it, in plain words, the pen must be turned and twisted about, and by chance a portion of a line is inked now and then, without any certainty whatever of leaving an equal deposit of ink all along the line. The remedy for this evil is to keep the drawing pen constantly in good order; this may be effected by the draughtsman, if provided with a small piece of Turkey stone, and the pen may be much better set than one can have it done by the mathematical instrument maker. Another thing which tends in a great measure to produce uneven lines, is the ink not being properly mixed, or suffered to become too thick, as it will, by being exposed to great heat from gas, &c., in overcrowded rooms*. The author would have it clearly understood that although the imperfections above enumerated are but too often to be found in surveyors' maps, yet it is by no means insinuated that maps are not by some persons very correctly and beautifully drawn in the present day. Maps are best drawn in London, Liverpool and other large towns, where the best assistance is to be procured. The great aim of pointing out the foregoing imperfections is to warn beginners not to fall into the like errors. The student is recommended to peruse the following

INSTRUCTIONS FOR MAP DRAWING.

Water used for mixing Indian ink to be kept free from dust.

TAKE the sheet of paper on which your map is to be drawn, spread it out evenly so that no crease be anywhere found, get your outline in pencil by any of the methods described in page 42; having got so far, mix your Indian ink with water kept for that purpose in a bottle closely corked. This is a very good way of keeping water to be used for this purpose, it prevents the dust of the room from mixing with it; by cutting a small hole through the cork and inserting a piece of duck's or crow's quill, a passage

* In order to keep the ink from drying up, saucers are made with covers to them. They may be had at Mr. Newman's, 24, Soho Square, or at any of the artists' colour shops.

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may be obtained for the water, without the necessity of removing the cork till all the water shall be used. But to resume—having mixed your ink, charge the drawing pen with a little of it, and holding your pen in a perfectly vertical position, pass it steadily and with a very slight even pressure all over the curved lines. And here it must be observed that we may usually find four series of lines running in as many different directions, viz., from left to right, or horizontally, north and south, or vertically, from the opposite corners, or diagonally; now we should draw the lines in each different position by as many operations as there are positions. The first step may be to draw in the entire outline of the plan; it may next be divided into sections or districts. Should the map be very large, as the plan of a parish or large estate, it may be divided into townlands, farms, or other subdivisions; that is to say, the outline of such divisions may with propriety be next inked in for the purpose of setting on different assistants to fill in the detail of each subdivision separately. The work being now laid out, or marked out, let the different assistants proceed to draw in, 1st. The fences and other lines running in one direction, next those running in another direction, and so on till the entire outline shall be inked in. It must be borne in mind that for the straight lines, a ruler or straight edge must be used to rule against. This method of subdividing the work is a very general practice and a very good one. If the map is to be coloured it is a very good way to colour it before inking in, by which means we avoid drawing off some of the Indian ink from the lines, as we must do if the inking in precede the colouring, for the ink drawn off the lines will mix with the clear washes and spoil them. The only objection to this system is the likelihood of the pencil lines being effaced by passing the brush charged with colour over them, or being altogether obscured by dark washes—neither objection carries with it much weight; maps and drawings may be coloured without effacing the lines, the brushes used for colouring being of too soft a nature to effect any injury. As to the pencil lines being obscured by dark washes, it may be stated that the majority of washes used on maps and drawings are of too transparent a nature to obscure them. According to the uses for which maps are intended so are they coloured more or less. Maps drawn on paper are generally coloured, either partially or wholly. The houses are almost always coloured. The dwelling-houses are washed with crimson lake or carmine, the outbuildings with Indian ink; if the water be *shown* on maps drawn on paper it is usually done by washing those parts enclosing the water with a pale wash of Prussian blue; along sea coasts, margins of lakes, and wide rivers, a very pleasing and natural effect is produced by using overlays of the same wash in order to produce the appearance of waviness. The hills are sometimes represented on plans, but rarely on manuscript plans, from its being attended with very great loss of time. The hills are seldom represented, except on estate maps and on engraved maps of large districts. But to return to the general subject of the order of

Rules for sub-
dividing the
work.

Advantage of
colouring maps
and drawings be-
fore inking them
in.

Manuscript
maps are usually
coloured par-
tially or com-
pletely.

How to colour
houses and wa-
ters.

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Order of proceeding with the work.

proceeding in drawing a map. Having drawn your lines and coloured the map, you must next consider what characters you will use for writing the different portions of it. On this subject the author trusts that, with the assistance of the examples and instructions embodied in this work, the reader will be enabled to produce maps written as they should be. The great mass of the writing being done, it is usual to next proceed to the *scale, north point, or meridian and title*; these three portions or appendages are generally left for the last, but if the map be sufficiently large for a number of assistants to work at it at the same time, the scale, north point and title may be done while the other parts are being drawn.

Respecting the unsightly prominence of some portion or portions of the map:—

Of the proper proportion of the different classes of writing.

The characters used for writing the names of places and things represented on maps, should bear such a proportion to each other as the relative importance of the objects so named or written bear to each other; for instance, let us take a few of the objects usually to be met with on maps. Suppose then we have on any one map the following objects against which it is necessary to write the names:—

A city.

A town.

A great lake.

A small pond.

A large demesne belonging to the lord of the manor, and containing three or five hundred acres.

A small farm containing half-a-dozen acres.

A castle.

A gate lodge.

Now it would be excessive bad taste to write the name of the town larger than, or as large as, the name of the city; the name of the small pond larger than, or as large as, that of the great lake. It would be equally ill judged to write the name of the six-acre farm in as large characters as the name of the demesne of three or five hundred acres, or to write the *gate lodge* as large as the *castle*; but on the contrary, as has been already stated, each should be considered and written with characters representing as nearly as possible the relative importance or proportion each object bears to its neigh-

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bours. A very long chapter might be written on this subject. It is hoped that what has been here offered will be fully appreciated, and that it may lead to further investigation. At a future time something more may be added. Another inconsistency which may frequently be observed is that of having on a plain and trifling map, say a mere outline, a *great daub of a title* abounding with elaborately ornamented letters and flourishes. This is about as great an absurdity and offence to good sense as it would be to see a poor man with his clothes in tatters adorned with white kid gloves and handsome diamond rings; in short, whatever obtrudes itself too much on the attention of the observer, without some good reason for its so doing, may be said to be out of keeping, and inconsistent in map drawing, as well as in other matters.

3rd. *The unmethodical representation of natural objects, &c., is to be reprobated.*—This is a failing with many good surveyors: the attempt made at drawing trees, rocks, and other natural features of common occurrence, is in many cases totally void of any character, except it is the character of mediocrity. Those gentlemen who are not above learning are amply provided with examples in this book of the details alluded to. *The trees drawn from nature* are especially recommended to the notice of surveyors and draughtsmen who would depart from that unmeaningness of outline which is usually adopted alike on maps of all classes, and with the view of representing trees of all descriptions, distorts them all alike. Before quitting the subject it is considered necessary to draw attention to the absurd practice of lugging in on all occasions a description of lettering called by the names of *Egyptian letters*, or *block letters**. It is not unusual to find maps altogether written with letters of the above description.

The propriety of denominating these letters *Egyptian* appearing doubtful, they shall for that reason, in this examination of their fitness for use on plans, be denominated *block letters*. Many reasons might be advanced to show the unreasonableness of the map draughtsman's resorting to this letter as to his only succour. To spare the reader the prolixity of a full investigation of the merit or demerit of its universal adaptation, it may be briefly decided to resort to a few precedents for its exclusion.

1st, then, Legitimate map draughtsmen, who have been properly brought up to the

* By printers and type-founders called letters sans serif.

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profession, will not shackle themselves by the universal use of this or any other class of characters.

2nd. Its universal adoption is not to be found in engraved maps of any character or standing, as atlases, charts, or particular maps of countries, &c.; on the contrary, it is scarcely to be found even partially used in such maps. It has been said that legitimate map draughtsmen will not confine themselves to any particular character for writing their maps. Let it be clearly understood that by legitimate map draughtsmen are meant those draughtsmen who have been regularly brought up to the profession of surveying, plotting, and copying maps. It is maintained that persons so educated are alone legitimate map draughtsmen, and that they alone are the proper persons to be entrusted with their construction, or copying, as the case may be. The why and wherefore of the impropriety of using block letters only on plans is explained in page 50; for a further proof of the authenticity of the statement, the reader is referred to the maps of draughtsmen of any eminence. It is easy to account for its modern introduction: it is to be attributed to two causes, viz., the speed with which letters of this class are formed, and further, because by reason of the extreme simplicity of their construction, any person, even the least practised hand, may form them. And here we have to regret the non-existence of a proper training for draughtsmen. The deficiency may be remedied by teaching this branch of art in our schools. These letters are evidently derived from the old Greek letters*; they however more nearly resemble the old Roman letters, (which were remodelled from the Greek,) with the omission of the *tops* and *bottoms*, or *serifs*.

Of the proper
persons to be
entrusted with
the getting up
of maps.

OF *ITALIC WRITING* (BY ENGRAVERS AND LITHOGRAPHERS DENOMINATED *STUMP WRITING*).

THIS is decidedly the most useful hand which the draughtsman can write. It is rather difficult to acquire at first. This arises from the almost total absence of straight lines, which may be formed much more easily than curved lines; nearly all the lines in this hand terminate in curves either at top or bottom. To write it well a certain freedom of hand must be acquired. Premising that writing in general is a species of drawing,

* See examples in Fry's Pantographia.

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Italic writing may be called *free-hand* drawing, in which less mechanical aid is either available, or required, than in drawing or writing many other characters. In the Roman, for instance, the letters being formed for the most part of straight and regularly curved lines, they may be for the most part ruled in with the mathematical drawing pen and bow pen. Italic writing has much to recommend it before every other style of writing used in mapping, viz. :—

Superior usefulness of Italic writing.

1st. Its extreme usefulness and general adoption for expressing the under features.

2nd. Its facility of formation when one becomes master of the manner of writing it.

3rd. Its usefulness in representing the under features on both manuscripts and engraved maps is fully confirmed by its general adoption. The general adoption of it arises from its fitness, and from its facility of execution. Its fitness may be said to consist in its unobtrusiveness. Block lettering, as regards *its* fitness, or rather unfitness, when contrasted with Italic, bears the same relation to it as the atlases produced three or four hundred years ago bear to those of the present day (with all the modern discoveries) for the study of geography.

ANALYSIS OF MAP DRAWING.

MAPS are essentially composed of *lines*, the only other element in the composition of plain or uncoloured maps being *dots*. These latter are used in great variety in forming dotted lines for various purposes, as will be explained hereafter. Lines may be divided into *perfect* and *dotted*. *The perfect line is continuous or unbroken throughout its entire length.* *The dotted line*, as the term implies, *is formed of dots*. Lines may further be divided into straight and curved; also into thick and thin.

OF PERFECT, OR CONTINUOUS STRAIGHT LINES.

The straight line, as well as the crooked, is used of different thicknesses for different purposes. *The thin straight line* (A) is used for drawing straight fences, roads, and drains, for outlining buildings, for the hatchings or section lines on plans of buildings, (see plates STREET IMPROVEMENT PLAN, AND ARCHITECTURAL DRAWING;) in some cases for representing water as on straight canals. See plate SIGNS USED IN MAPPING, No, 1; for sectioning different descriptions of material as timber, brick, stone, iron, and for various earths, (see plate METHOD OF SHOWING STRATA IN SECTION,) and for many other purposes.

The thick straight line (B) is used for drawing stone walls on plans, for the shade lines of buildings, &c.; and it is sometimes used very thick, (C,) for drawing the *border lines* round plans and drawings.

OF CURVED OR CROOKED (PERFECT) LINES.

Every line which is not straight is called a *curved or crooked line*. These curved or crooked lines (as relates to Maps) may be subdivided into three classes, viz.:—

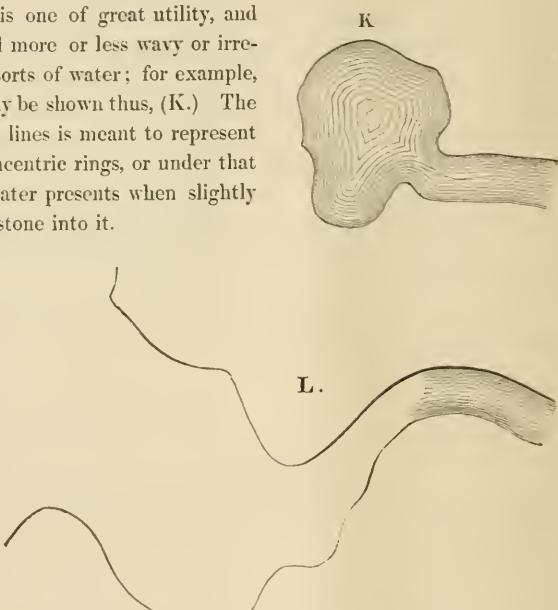
Fig. J.,) the high or low water-mark, the short dot being used to show the opposite water-mark as the case may be. The *thick dotted line* is used of different thicknesses in different situations. It should be drawn much thicker when delineating any very remarkable features than when used for ordinary purposes. For example, should a plan be required showing the navigable channel of a river, the navigable channel should be shown with a *thick long dot*, and the high water-mark with a *thin long dot*. The reason for this is obvious. The navigable channel of the river is the most remarkable feature of the plan, and we shall make it appear most prominent by using the dot here recommended.

Different lines
for representing
various descrip-
tions of water.

The wavy or rippled line is one of great utility, and very expressive. It is used more or less wavy or irregularly curved for different sorts of water; for example, in a quiet river or lake it may be shown thus, (K.) The waviness or curvature of the lines is meant to represent the water by a series of concentric rings, or under that appearance which smooth water presents when slightly disturbed, as by throwing a stone into it.

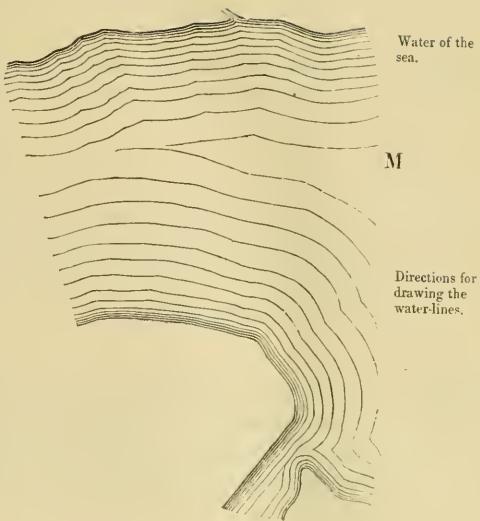
Water of a
creek or tidal
river.

In a creek or tidal river, where the flow and ebb of the tide more or less disturbs the placidity of the water, a different sort of ripple may be used, as in example (L)*.

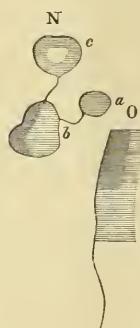


* The water-lines are placed close together at the margin of a river or lake, in order to represent the effect produced in nature, from the shade thrown from the bank; and the lines are placed farther and farther apart, as they recede from the bank or converge to the centre. We know that water presents the lightest appearance in that part where it is free from the shadows thrown by the banks, and receives its full share of light from above.

For representing the water of the sea, a ripple something similar to the foregoing (L.) may be used. It should, however, be bolder, as at (M). In this latter example, the lines being placed farther apart, convey the idea of an increased space. It should be observed in delineating water, by a series of concentric lines, that *the draughtsman must begin to form the water-lines close to the shore*; and he may extend the space between the lines in proportion to the extent of space he has to deal with; that is to say, in a small pond the lines will be few and close together, in a large pond they will be more numerous and further apart; in the open sea they will present that bold appearance shown at (M).



Besides the methods of representing water shown above, lakes and ponds are sometimes shown by horizontal lines thus, (N.) Water along coasts is sometimes shown thus, (O.) When the lake or pond is very small, as *a*, horizontal lines may be drawn entirely across it. When the lake or pond is large, as *b*, horizontal lines may be ruled across it, and *softened off* by a second set of shorter lines intervening; or they may be only placed round the margin of the lake or pond, as *c*. This method of representing water appears to have arisen, in the first instance, from a desire on the part of draughtsmen or engravers to curtail the labour of watering large maps, for this is a much more expeditious process for large work than that shown in (K), being mere ruling, whereas the method shown at K requires a steady hand, and the greatest care. It is worthy of observation, that by commencing the water-line close to the coast, and following the twistings and bendings in a regular succession of lines, (to imitate the natural ripple,) a very natural and pleasing effect is produced, as in examples (P Q).



Water along a bold rocky coast.

In example P a bold rocky coast is exhibited. The water is proportionably bold and irregular.



Water along a level coast.

In example Q a level coast is exhibited; the water is proportionably placid; thus, by attending to the directions given in the foregoing Analysis, the most inexperienced person must insensibly produce the proper effect.



Elements of writing and lettering.

Having shown that maps are formed of lines and dots, it may be as well to add that the composition of all writing and lettering is the same, as will be clearly understood by referring to the many plates of writing and lettering contained in this work. The most ornamental, as well as the plain letters, are nothing more than an accumulation of lines and dots, placed in different positions in order to produce different effects.

HANDBOOK
FOR
PLAIN AND ORNAMENTAL MAPPING
AND
ENGINEERING DRAWING.

THE Plates of this work (produced as they have been without regard to order) may be unintelligible to many by whom they might otherwise be found serviceable, a description of them has therefore been considered advisable. The letter-press of the work has been deferred, in order to afford an opportunity of searching all the existing works on the subjects already published, and it is hoped that such delay will have a beneficial effect, in laying before the profession a series of rules and examples in such a condensed form as will admit of *immediate* reference to any subject required. As an apology for the want of letter-press description in the first instance, it may here be observed that the original design was simply to furnish a set of *drawings* which should serve as models for future productions.

DESCRIPTION OF THE PLATES

or

PARTS I. II. III.

PLATE I. is a sheet of north points for maps and plans. The point at the right hand top corner is one of the plainest description, being a simple cross, formed by two straight lines intersecting each other at right angles, with an arrow-head at top. The point at the left hand top corner is one of the same character, a little more finished. These two points are suited for drawing on small plain or rough maps, as maps on conveyances and leases, plotted plans, &c., &c., where the *position* of the meridian or north point is *only* required to be shewn. The centre point is a highly finished and elaborate drawing. The two lower north point heads may be used on fair maps, and fitted on to various centres, designs for which will be found farther on.

PLATE II. contains six designs for borders for maps, or drawings, from a plain line, as that at top left hand corner, to a border composed of a number of lines, as those at the bottom of sheet. The top centre ornament consists of a pole, on which is shewn a scale, and suspended thereon a handsome drapery, offering an appropriate space for the surveyor's name. The bottom ornament is a design for a small title to a section placed on a drawing board, and shews the instruments used in the operation of levelling.

PLATE III.—The top trees are suited for ornamental woodland, as parks, and clumps of trees in gentlemen's demesnes, and where (as is too frequently the case in maps) no *particular style or sort of tree* is meant to be represented. Farther on, diagrams or patterns will be found for all the British forest trees.

The cliffs, as the trees just described, are not meant to represent any *particular sort* of cliffs or rocks. Farther on will be found diagrams or patterns of stratified rocks, clays, &c., &c.; also plates shewing their application to the projection of engineering sections. The sketch at the right hand bottom corner represents the method of delineating orchards, water, and plantation or shrubbery. Next follows a rock or headland, in the style of line engraving, and at the left hand corner is a pattern for drawing trees on rough or plotted plans.

PLATE IV. is a collection of words in general use among surveyors, engineers, &c., &c. They are repeated in different characters and sizes, the object being to supply a collection which shall apply in practice to maps and plans of different styles and sizes; and by giving such a collection it is presumed much facility is afforded for designing or constructing titles. The word **ESTATE** is written in six different pattern letters, thereby furnishing the draughtsman with the means of writing the *entire word* in as many different hands or patterns. The word **RAILWAY** is in seven different patterns, and, like the word **ESTATE**, it is intended that each letter should supply a separate design for writing the whole word.

PLATE V. is a collection of parts or compartments of titles, which may be joined together, or used as occasion requires. It will be observed that those words, or parts of titles, which occur the oftenest in practice are repeated with much variety of style and penmanship.

PLATE VI. contains three handsome designs for scales for maps.

PLATE VII. shews at top the combination of the diagrams (which will be found farther on) of water, sand, trees, and grass land. The figure or drawing at bottom (which is a cross section of a weir) represents limestone in two different states, viz., in its natural or stratified state, and also in the shape of solid masonry; the difference between which will be easily detected.

PLATE VIII. is a sheet of designs for north points, being a style between the very plain and the highly finished.

PLATE IX. is a design for a title.

PLATE X. (*Hills*, No. 1. *Picturesque*) represents hills illuminated by an oblique light; farther on will be found hills illuminated by a vertical light. The merits of these different modes of representation, as well as the *contour line* system, will be fully treated in the general remarks on, and instructions for the drawing of maps and plans.

PLATE XI. *Forest Trees in Elevation*, No. 1.—This plate is given with the view of affording surveyors and others the means of representing the different kinds of trees that are most frequently met with on the face of a country. Each tree is given *en groupe* for effect, and also shewn singly at the same size, as may be seen by the large single tree at the left hand of each compartment. It is next reduced to a smaller scale, in order to bring it at last to a size (the smallest tree throughout the diagram) which shall suit for maps. And surveyors will find an advantage in jointly using this method of *delineating trees as they meet them*, and not, as at present, representing—or perhaps, more properly speaking, misrepresenting—all alike. Indeed, the greatest difference is discernible between the *young and old* of many trees, as is shewn by the young and old of the ash, the young and old of the oak, and many others which will be given in the next Plate of Forest Trees. This plate is the first of a series.

PLATE XII. *Signs used in Mapping, &c.* No. 1.—This sheet, principally compiled from Captain Dawson's Conventional Signs, furnished to the Tithe Commissioners, and to be used by the Surveyors employed on the Tithe Survey of England and Wales, will be found useful, especially to young draughtsmen, and others desirous, as all should be, of complying with an uniform method of delineating the several objects that are met with in surveying a country or district. This sheet is the first of a series.

PLATE XIII. *Method of shewing Strata in Section, &c.*—Considerable pains have been taken to make this set of diagrams as perfect as possible. The different earths are here represented in a distinct manner, and the contrast is shewn by the combination of the diagrams in a supposed section at

the bottom of the plate. This plate is the first of a series; farther on will be found the stratified rocks.

PLATE XIV. *Alphabets*, No. 1.—This sheet of alphabets has been produced with infinite labour, and arranged in rather a novel and comprehensive manner. It will be seen that it contains a very great variety of styles, from the plainest to the most highly finished. To explain the *leaving out* of some of the letters we will take the *outside complete circle*, and beginning at the letter *a*, we find that it is a different pattern to *n*, *n* different to *c*, *c* to *d*, *d* to *l*. Looking farther for the contrast between *e* and *r*, we find the *r* left out, and for this reason, viz. the letter *e* answers all the purposes of a pattern for *r*, being of a similar shape. Following on this alphabet, we find that the letters, viz. *i*, *j*, *l*, *p*, *q* are omitted, and for the following reasons, viz., for the letter *i*, the straight down or upright limb of any of the letters may be used, as of the *u*, *k*, *t*, &c., &c., as may also the *j*. The *i* may readily be formed from the *e*, &c., &c. The *p* may readily be formed from the *b* or *r*, which are both given. The *q* may be formed from the *o*. I have given a full description of the method I have here adopted, and which I shall probably adopt in other alphabets not yet published. The advantages are twofold, being a saving of space as well as a saving of unnecessary trouble to parties referring for designs. In the smaller alphabets, they being for the most part plain, this method of saving space will not be a desirable object, and it will be found, for the most part, that in such cases *all* the letters are given. It will be observed that in these alphabets the letters are placed to read from left to right, thus: *a* in the centre, *b* at the left hand, *c* to the right, and so on, save where letters are passed over, as has been explained above.

We next come to the *Old English Text Capitals*; and here we have nearly the entire alphabet, and all different designs, while in the next line but one we have the small letters of the same alphabet, each letter of which corresponds in design with the large or capital letters. The figures or numbers at the four corners of this plate will be found useful for numbering sets of plans or drawings.

PLATE XV. *The Method of delineating Mountains*.—This method of

representing a mountain chain is one which admits of great force. Though the ordinary practice of the surveyor does not call for this mode of representation, yet for maps of a certain class it may be found desirable, and this plate is offered as a good specimen of this peculiar method of representation: for engravers and lithographers especially it may be serviceable. This method has been long known, and in the maps of Speed* we find hills rather grotesquely drawn in elevation.

Here ends a description of the Plates in Parts I. II. III.: the rest of the Plates in the three succeeding Parts will be referred to in the body of the work.

* See "The Theatre of the Empire of Great Britain, by John Speed. London, 1611." Speed lived in the reigns of Elizabeth and James I. The maps in the above work are curious, as shewing the different style of execution between that of his time and the present.

PLATE XVI.

STRATIFIED ROCKS.

COMPACT LIMESTONE FOR BUILDING.

THIS material may be of various kinds, considered geologically. For example, carboniferous, calp, taliferous, or belonging to the new red sandstone formation ; lias, or of the chalk formation. The diagram first given of this rock may represent the limestone of any, or all, of these formations ; and if a distinction is required in the sections of the Engineer, he may adopt the use of colours to indicate the lithological differences. The reason for representing the limestone for burning and building, with different lines, is to show that generally, the limestone applicable to building, is of a more massive character than that for burning ; which latter, to make evident, has been represented by lines crossing at a more acute angle than the former diagram exhibits.

Limestone of different qualities.

Lithological differences may be indicated by colours.

In the *limestone containing beds of shale*, these have been represented by a number of closely drawn lines, to give the character of fine lamination.

Sandstone. These diagrams attempt, like the former and the succeeding ones, to give well defined and characteristic examples of the different kinds of material meant to be represented ; thus the sandstone is shown to break with cubic masses, and not with acute angled forms, like the limestone ; but it must be remembered that those forms are, at the best, *but provisional*.

Sandstone.

The diagram of the *sandstone, with layers of coal*, represents the rock as being broken by what the miners term *faults**, or breaks in the continuity of the strata.

* A Fault is a slip, shift, or break in the continuity of strata ; an example is shown in the *coal strata*. PLATE, APPLICATION OF THE DIAGRAMS OF STRATA TO THE PROJECTION OF ENGINEERING SECTIONS, see second section.

In Macgillivray's *Manual of Geology*, page 108, the following description is given of a Fault :—“ When

The diagram, *irregularly laminated sandstone*, represents, by the strong lines, *the lines of bedding*, or stratification of the rock; and by the smaller markings, the *lamination* of the rock, which will be seen to be exceedingly unconformable, one bed with another.

Clay Slate. These four diagrams are more provisional than perhaps any of the others, being, indeed, *mere diagrams*.

Granite.

Granite. This diagram represents, by provisional lines, a rock massive in its bedding, but highly crystalline in its structure, its formation being due to igneous action at a very early period of our planet's existence.

Although, at first sight, it may appear superfluous to touch upon Geology in a work of this description, yet, upon due consideration, it will be found not altogether unnecessary. In the present day, when public attention is so much directed to the subject of Agricultural Engineering, it is not unlikely that Surveyors will have occasion (in order to make their plans and sections intelligible) to embellish them with *Geological Diagrams*; and further, since the establishment of the *Museum of Economic Geology* at Craig's Court, many of our Railway Sections have been (if I may so speak) geologised under the superintendence of the Engineers employed upon them. THE DIAGRAMS OF STRATA given in the HAND-BOOK FOR MAPPING are offered to those persons who have not hitherto turned their attention to the subject; those persons, in fact, who are in want of a conventional method of expressing the various substances they may wish to represent; the diagrams have been prepared with every care, and have been submitted for the approval of an experienced Geologist. The utility of the practice of Engineers and Surveyors recording on their sections the geological features or composition of the crust of earth through which Railways pass, needs no comment in this place. Mr. (now Sir Henry T.) De la Beche says, at the conclusion of the second edition of his work, "*How to observe Geology.*" "In the first edition of this work it was suggested that great benefit might arise if there were some National Museum for the purpose of showing the application of Geology to the

the strata are dislocated, so that on one side of a fracture or line of accidental separation they no longer correspond with those on the other, although they had evidently at one time been continuous, there is produced what is called a FAULT."

In *Lyell's Elements of Geology*, vol. 1, page 129, we have the following description of a Fault:—"It is not uncommon to find the mass of rock on one side of a fissure thrown up above, or down below the mass with which it was once in contact on the opposite side. This mode of displacement is called a shift, slip, or FAULT."

useful purposes of life, or, in other words, the mineral wealth of the country; one in which the various mineral substances used for roads, in constructing public works or buildings, employed for ornamental purposes, from which useful metals are extracted, or which illustrate the application of Geology to Agriculture, should be arranged with every reference to instruction, and the situations whence they were obtained be carefully marked on good maps, such as those of the Ordnance. Since that suggestion was offered, His Majesty's Government have liberally seconded the views of the Author, by directing the formation of a Museum of Economic Geology, under the department of Woods and Public Works; and it is therefore hoped that a large amount of information which is now scattered may thus be condensed, and those interested be enabled to judge how far our known mineral wealth may be rendered available for any undertaking they are required to direct, or may be anxious to promote for the ornament or good of their country."

APPLICATION OF THE DIAGRAMS OF STRATA TO THE PROJECTION OF ENGINEERING SECTIONS.

Railway Section required by the Standing Orders.

The section at the top of this plate is such as Engineers and Surveyors are required, by the standing orders of Parliament, to deposit with the Clerks of the Peace of the different counties, and the clerks of the parishes through which a Railway is proposed to be made; also at the Private Bill Office, before applying to Parliament for leave to bring in a Bill for the formation of a Railway.

Geological Section.

In the second section, the diagrams from the two sheets of strata, are placed in that position which they would be most likely to hold in reality. These diagrams may be used to show the geological nature of the country.

The bottom section is another example of the last-named description. It has been selected from "The Fourth Report of the Commissioners for the Improvement of the River Shannon." The main object of this sheet of sections is to show Engineers and Surveyors how to apply the two foregoing diagram sheets of strata, when required to exhibit a geological section.

HILLS—No. 2.

METHOD OF REPRESENTING HILLS AND VALLEYS BY "NORMAL CONTOURS," OR BY A SERIES OF LINES DRAWN AT EQUAL VERTICAL DISTANCES, AND PARALLEL TO THE HORIZON.

It is hoped that a careful inspection of this plate, and comparing the section on the line A. B. with the line A. B. on the plan, will convey to the reader's mind the application of the method. It is considered unnecessary to enter here into the subject, on which there has already been much controversy, one party advocating *oblique light*, another *vertical*, while a third recommends the combination of both—a recommendation which appears reasonable from the arguments advanced in its favour. It may be briefly observed, that in this example the light is supposed to descend in parallel rays—this is called the vertical illumination.

Light on Hills,
Oblique, Verti-
cal, and both
combined.

It was my intention to have *handled* this subject, and I prepared many plates to illustrate it, but I found, on reference to existing works, that it had been already ably treated. The knowledge of this fact should not have swayed me from my first resolve, especially as many of the works to which I allude will be out of the reach of a considerable portion of my readers, but I found that I should have to go to such a length, to make the matter intelligible, as would have altogether exceeded my limits.

The reader is referred to the following works:—

"*Memorial Topographique et Militaire*, No. 5." *A Paris.*

The article war in the "*Encyclopædia Britannica*," vol. 18, p. 703, is illustrated with many plans, containing hills. These hills are all shown under an oblique illumination. In Plate DXV. (*the march of an army through a mountainous country*) the mountains are shown in elevation, or as I have shown them in part 3 of this work, plate "*MAP ENGRAVING*"—*the method of delineating mountains*. An inspection of the plate above referred to in the *Encyclopædia*, will better illustrate than my plate does the application of this method to practice.

OBSERVATIONS ON THE LAST NAMED PLATE, VIZ., THE METHOD OF DELINEATING MOUNTAINS.

Military use of this description of map.

It will be seen what powerful force of expression can, by this method, be thrown into a limited space. An officer, possessed of a faithfully drawn up sketch of this description, can readily determine the most desirable route for his troops to pursue.

The disposition of troops on a march depends on the nature of the country to be passed through.

On the nature of the country to be passed through entirely depends the disposition to be made of troops. For instance, in a mountainous country where the enemy would be able to attack with infantry only, he must be opposed with infantry. Supposing an army to be marching on a road through a mountainous country, with the infantry in front for the reason above-named, it would be desirable to have some artillery posted behind the infantry; for should the road through which the columns pass be broad enough, some pieces of cannon may be sent into the front, and an advantage may be gained by thinning the enemy's ranks with grape shot. Should the road, on the contrary, be too narrow to admit of the artillery coming forward, the enemy must be charged with bayonets. As cavalry could not act in this situation, their march must be covered by infantry.

In the Encyclopædia Britannica, vol. XVIII. page 708, we find the following:—

Method of marching an army through an open country.

“When an army is in an open country, the general may take whatever road he thinks most convenient without being under a necessity of keeping the beaten road. If he chooses to march across the country, it may be done by cutting down the hedges, filling up the ditches, levelling the ridges, filling up the hollow ways, thereby rendering their ascent or descent easy, and by building bridges over the streams and rivulets which divide the country.”

The general must know the nature of the ground on which he intends to encamp.

Again, “A general should never cause an army to move without having previously considered and examined the intended march of it, nor without a thorough knowledge of the enemy's position, and where he is, or without *knowing particularly the ground intended to encamp on.*”

Then we find the reason given for this caution—

“An army ought never to move but with some design, either to seize on some advantageous post, to prevent an intended march of the enemy's, to draw him into a

disadvantageous situation, to deprive him of subsistence, or to obtain some for himself."

Thus we see how very essential it is for commanding officers to be possessed of a graphical representation of the country forming the line of march of an army, also of the present, or probable seat of war.

The young officer is recommended to not only make himself conversant with the merits of this description of delineation, but to accustom himself to make such sketches; first, from good existing drawings approved by his instructors, and afterwards more particularly upon the ground. It need hardly be stated here, that in active service this will not be the least useful of an officer's qualifications. In many cases the fate of an army must in a great measure depend on their knowledge of the country into which they are about to enter.

The Map Engraver especially may learn a useful lesson from an examination of these plates; he is also recommended to read the article.

"Instructions for Civil and Military Surveyors in Topographical Plan-drawing, &c., &c." By William Siborn, Lieut., h. p. 9th Infantry. London: Whittaker, 1822.

This work recommends the method of Major Lehmann, of the Saxon Infantry. It is principally intended for Military Surveyors, and no doubt it would be very desirable for Civil Surveyors to adopt some such system to mark the slopes of ground; however, it is to be feared this system can never be brought into general practice, for one or both of the following reasons, if for no other, viz.:

1st. Civil Surveyors have not time for such elaborate performances.
2nd. They are not paid in proportion to the labour which such a system would entail upon them. Surveyors, especially the rising generation, cannot be too strongly recommended to make themselves acquainted with the systematic method employed by Military Surveyors and others, both in this country and on the Continent, for developing the natural features of ground. Map Engravers, too, should receive this class of education.

"A Treatise on Practical Surveying and Topographical Drawing." By Lieut. Siborn. London, John Murray, 1829. In chap. vi. page 82, and chap. vii. page 95, most valuable and plain instructions are given for Hill Drawing, both in the field and drawing office.

"Outline of the Method of conducting a Trigonometrical Survey, for the Formation of Topographical Plans, &c., &c." By Lieut. Frome, Royal Engineers, F.R.A.S. and A.I.C.E. London: John Weale, 1840. In

chap. vi. page 69, a short description, very similar to the foregoing, may be found. The patent process of engraving by a machine, known by the name of Anglyptograph, is here spoken of, and a specimen of hill engraving by this method is given.

"Plates to illustrate Macaulay's Treatise on Field Fortification, &c." Fraser, London. 1834. Plate 4 contains specimens of contours for hills; plate 9 contains some good hill sketches, rocky and broken ground, woods, parks, orchards, embankments, raised and hollow roads, marshes and some military conventional signs. Plates 10 and 11 contain field sketches of hills, &c., expressive of the country along the line of march of an army. Plate 12 is a table or *"method of arranging the information which is to be embodied in the report of a general reconnaissance."*

"Treatise on Topographical Drawing." By S. Eastman, Lieut. U. S. Army. Wiley and Putnam, New York, 1837. In chap. ii. page 10, chap. iii. page 25, chap. iv. page 30, information of a similar class to that contained in the foregoing works is conveyed. Chap. ii. is on the Topographical Delineation of Hills; chap. iii. Oblique Light; chap. iv. Topographical Delineation of Rocks.

"Papers on subjects connected with the Duties of the Corps of Royal Engineers." London, 1838. Page 8 commences an article on Contoured Plans and Defilade, by Lieut. Harness, Royal Engineers. This chapter is both very interesting and instructive. It commences by informing us of their use by the Engineer Officers, and of their being first introduced to public notice by Captain Macauley, in the appendix to his work on Field Fortification. Lieut. Harness informs us that this system was invented by the French. His paper, he says, is principally taken from a Memoir by Captain F. Noizet, to be found in the sixth number of the *"Memorial du Génie."* The article is illustrated with three plates.

It were easy to refer to numerous works in which the subject of drawing and engraving Hills and Topographical Plans generally is treated of. These works, it may be observed, differ but little from each other. I have selected the foregoing for reference, out of a host of similar works. In making this selection, I believe I have catered as well as I could have done for the topographical plan draughtsman, whether civil or military; at all events, if he wishes to look further, an examination of those above mentioned will introduce him to many more of the like class.

ENGINEERING DRAWING.

DETAILS OF RAILS AND CHAIRS AS LAID ON THE MIDLAND COUNTIES RAILWAY.

This drawing is intended principally as an example for practice. In the plain copy of the work it is given in outline, only coloured pink to show the joint chair, which is larger than the intermediate chair; an index of colours is given, but unfortunately the distinction between wrought and cast iron is not made manifest on the drawing; it should be done by letters of reference, or by writing on the different parts of the drawings.

In the coloured copy, each part is coloured in such a manner as will explain (by reference to the index of colours) the materials of which it is composed.

It is usual in drawings, where both cast iron and wrought iron are represented on the same sheet, to make a marked distinction in the colours used to represent them. Cast iron is generally made of a duller colour than wrought iron. As I have shown in the "index of colours" to this sheet those which may properly be used, I shall not here repeat them, further than it may be necessary to make the following remarks understood.

For wrought iron, I believe Prussian blue is the colour generally used. In its pure or raw state it is rather too bright, and may be improved by the addition of a very little indigo.

Again, cast iron is generally coloured with pure indigo. It may likewise be improved by the addition of a very little burnt sienna and lake. For the oak sleeper I have used burnt sienna and British ink, as colours which may properly be used to make oak colour.

It is very possible that other mixtures may be made which would as much resemble the colour of oak wood. But finding this simple mixture of two colours to answer the purpose, I have adopted it in the *index of colours*.

In like manner it may be observed, that all the mixed colours named in the *index* may be differently produced. As I have devoted a chapter to an explanation of colours, and shall take ample space to explain their uses, I shall not trespass more on the reader in this place, than to make one concluding observation—viz., to some it will appear strange that *British ink* should be recommended in preference to *Indian ink*,

C British Ink,
why preferable
to Indian Ink.

Example
of Engineering
Drawing for
practice in copy-
ing.

Wrought Iron
and Cast Iron
coloured differ-
ently.

Colours proper
to be used and
their admixture.

Mixed Colours
may be differ-
ently produced.

the latter being a colour much better known, and apparently as good. The reason is simply because it washes *less streaky* than “Indian ink;” or, to use an Artist’s phrase, it is not so liable to *sets*. It need hardly be said that good Indian ink is not always to be had. But if it can be procured *good*, there is no reason why it should not be used. Before concluding a description of this plate, I have to observe that the method of showing two drawings in one, here adopted, is objectionable in two respects, viz.—first, a want of clearness, occasioned by the *two sets of lines* crossing each other; second, in a coloured drawing the fine effect of good colouring is spoiled by the *pink wash*, or any other means which may be used to show one part, while the dotted lines are for the greater part obscured by the colouring. This drawing in other respects affords a good example for practice for the learner.

Method
of showing two
Drawings in one,
why objection-
able.

DESIGNS FOR TITLES.

Observing the want of any guide for Surveyors and Engineers in the writing of their titles, there are given in this plate *five complete titles*, all of them more or less different. The two bottom ones are executed in a very plain style. The two top ones and the centre one are somewhat more elaborate. The student who wishes to arrive at perfection as a map writer is recommended to *trace and retrace* these titles before he attempts to copy them in any other way. Thus a freedom and readiness is acquired in passing the pen over the letters, which cannot be obtained by any other method of copying them. But before using them at all the student should turn to the plate of *writing and printing*, in which is shown in detail the "MECHANICAL METHOD OF FORMING TITLES FOR MAPS, &c." In this plate the student will find the simple mechanical method reduced to practice for his guidance, in such a form as it is hoped cannot fail to be clearly understood at sight.

Plain and
finished Titles
for Maps.

Tracing the
best method of
learning to write.

Interesting to
Persons study-
ing Church Ar-
chitecture.

GOTHIC LETTERS AND NUMERALS.

These letters and numerals are taken from Cottingham's Henry the Seventh's Chapel, Westminster. By Architects (in this age, when church architecture is studied with so much interest by a large portion of the community) this specimen will be appreciated *.

* For examples of many curious alphabets and writing of various countries and ages, see "*The Origin and Progress of Writing, as well Hieroglyphic as Elementary, illustrated by Engravings taken from Marbles, Manuscripts, and Charters, ancient and modern, &c.*" By Thomas Astle, Esq., F.R.S., F.S.A., and Keeper of the Records in the Tower of London." London, 1784.

"*The Origin and Progress of Letters, an Essay in two parts, &c., &c.; the whole collected from undoubted authorities.*" By W. Massey. London, 1763.

"Spectacle de la Nature, or Nature Displayed." Vol. 7, dialogue 20. The French Palæography. Plates XIV. XV. XVI. XVII. XVIII. XIX. XX. XXI. XXII. XXIII. XXIV. XXV. XXVI. contain examples of written characters of the 4th to the 16th century. These plates are accompanied with a familiar description, in which the letters of the different ages are pointed out with clearness and precision, and the way is laid for the study of so interesting a subject.

Alphabet-album collection de Soixante, Feuilles d'Alphabets Histoires et Fleuronnes Tires des principales Bibliothèques de l'Europe, ou composées par Silvestre, Professor de Calligraphie des Princes. Graves par Girault. Paris, 1843. Chez J. Techener, Editeur Place du Louvre, No. 12.

"Pantographia, containing accurate copies of all the known alphabets in the world, together with an English explanation of the peculiar force or power of each letter, forming a comprehensive digest of Phonology. By Edmund Fry, Letter Founder, Type Street. London, 1799."

"Calligraphische Handsammlung oder Sammlung der meisten in Deutschland üblichen Schriftarten, &c., &c., &c. Von Johann Evangelist Mettenleiter in Münchein."

MAP ENGRAVING, SPECIMEN FOR DELINEATING COUNTY MAPS.

In this specimen for delineating County Maps, both the Map Engraver and Draughtsman will find a *useful model* to guide them in their labours. This specimen is in the style of the Ordnance Survey Maps, from one of which it is taken. It affords an illustration of the conventional way of representing the different features usually met with in Mapping. The plate is executed in the best style of *Modern Line Engraving*.

Specimen of
Map Engraving,
in the style of
the Ordnance
Survey Maps.

METHOD OF DELINEATING A HIGH MOORISH COUNTRY.

This example is intended to answer a similar purpose to the foregoing plate. It is an extremely useful and forcible Engraving, and is calculated to be very serviceable to the Map Draughtsman, Engraver, and Lithographer.

STREET IMPROVEMENT PLAN.

Specimen of
Surveyor's Map,
now produced.

The top half of this example represents that description of drawing usually made in a surveyor's office, for the purpose of displaying a proposed alteration in a line of street. It is usual to survey and accurately plot all the houses in the immediate vicinity of the proposed new street. The outline of each block should be carefully measured and plotted; but it is not usual to go into the *detail* of such blocks, or of those lying at any considerable distance, inasmuch as it is unlikely that such blocks will be interfered with in the making of the street; while, on the contrary, the buildings lying in the direct course or line in which it is proposed to make the street should be surveyed most carefully, and shown in the fullest detail, with all *yards, passages, back-houses, stables, and sheds, &c.* In order to mark the distinction thus made in surveying the buildings, it is usual on the plan to wash over such buildings as are likely to be affected by the street, with a light wash of *Indian Ink*, and also to back line or *shade* them. In the blocks which, from their remote situation, are not likely to be affected, it is considered sufficient to *edge* them round with a bordering of *Indian Ink*.

Indeed, in some cases, they are merely *inked in*, and left without any further edging. The *extent* or *distance* to which the houses should be carefully surveyed and laid down on the plan, depends, of course, on circumstances, and is to be regulated by the judgment of the Surveyor employed to furnish such survey and plan. A reference to the example, and a perusal of the notes thereon, will, I trust, sufficiently elucidate the subject in addition to what has been said above.

Specimen of
Engraver's or
Lithographer's
Map, now pro-
duced.

The Engraver is sometimes required to produce a marked distinction between the portion proposed to be taken for the street and the rest of the plan. This he can easily effect by means of *provisional* lines, as shown in the foregoing example, in which the lines or hatchings used to point out the proposed line of street, are drawn in an opposite direction to the lines or hatchings on the buildings.

The consequence is, that the portion of the plan so crossed with two sets of lines is darker than the remaining portion. To effect this, lines may also be drawn in a horizontal position, if preferred, as in the adjoining Fig. 1, or by dots, as in Fig. 2.

These three methods may be found essential in some cases, to be used on the same drawing, to point out *different proposed* lines of street, as in Fig. 3.

Fig. 1

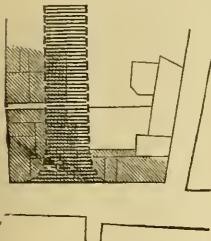


Fig. 2

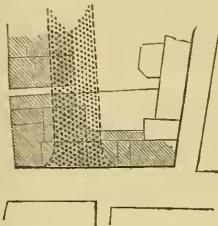
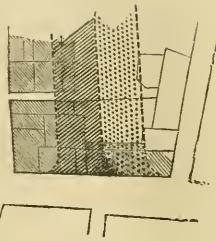


Fig. 3



ENGINEERING DRAWING.

SHOWING THE METHOD OF COLOURING STONE AND BRICK-WORK.

Suggestion for
colouring stones
of various de-
scriptions, in
their natural co-
lours, on Draw-
ings to accom-
pany specifi-
cations.

The object of placing together these portions of Masonry, &c., is to show how stones of various descriptions may be characterized and distinguished on drawings to accompany specifications. This may be effected by using different colours to point out the *sort* of stone to be used in each case; as for instance, should the Engineer consider it necessary to construct the different portions of his works of different sorts of stone, then it would be advisable to have each sort coloured the *natural colour* of such stone; this system would be much more expressive, and more clearly point out the nature of the work to be contracted for, than is generally observable on plans prepared for this purpose. In *working drawings*, Masonry is frequently coloured *pink*, as in the *proposed swirl bridge* from the "4th Report of the Commissioners for the Improvement of the River Shanou." See Plate of *APPLICATION OF THE DIAGRAMS OF STRATA TO THE PROJECTION OF ENGINEERING SECTIONS*. In some cases it is desirable to show *brick-work*, as in the example on this plate, instead of showing it by a *face wash*. On this plate examples are given of the method of colouring *earth-work*. A portion of a *metal bridge* is also shown.

EXPLANATION OF THE COLOURS USED ON THIS PLATE.

Mixture of
Colours.

The *face wash* on the "elevation of stone bridge," the *earth-work* and the masonry coloured brown (this represents limestone) are each formed of a mixture of *crimson lake*, *burnt sienna*, and *indigo*. The stones coloured with *light red* represent sandstone (see old red sandstone in Geological Section). The masonry coloured blue represents *whinstone*. This colour is made of *indigo*, with a very little *burnt sienna* and *crimson lake*.

The *metal bridge* is coloured with *indigo*. The plummer block is a mixture of King's yellow and carmine. This represents *gun metal*. The bricks are done with a mixture of *crimson lake* and *light red*.

ARCHITECTURAL DRAWING.

In this plate it is meant to convey an idea of some of the colours proper to be used for the different parts of Architectural Drawings and details.

Colours proper
to distinguish
different materials.

Only a small portion of each description of *material* is given in outline, and of this a still smaller portion is coloured. The reason for not colouring the entire drawing will be obvious to those who know the labour of colouring such details; and if the reader learns how to colour a small portion, he will be enabled also to colour a large one.

In this plate examples are given of colouring—

- Brick-work.
- Stone-work.
- Wood-work.
- Metal.
- Glass.
- Slating.
- Lead.

Also of Engraving and Lithographing, Stone or Brick-work, and Wood-work.

Authorities
for Conventional
Signs.

In this plate, as the heading implies, I have given a collection of Signs used by Civil, Naval, and Military Surveyors, Civil Engineers, and others. The works from which they have been principally collected are—"Memoriale Topographique et Militaire, No. 5, planches 1, 2, 4, 7, 18, 13." Published in Paris.

"*Eastman on Topographical Drawing. Plates 1, 4, 5.*"

A pamphlet entitled—"Ordnance Survey of Ireland; Boundary Department; General Instructions for the Guidance of the District and Assistant Boundary Surveyors, in the Performance of their Respective Duties." Published in Dublin, 1832.

From this last-named pamphlet, which was prepared by Mr. Griffith, the head of the boundary department of the Ordnance Survey of Ireland, I have taken the boundary marks, and some of the places of worship.

From the "Plates to Illustrate Macaulay's Treatise on Field Fortification," plate 9, published by Fraser, London, 1834, I have selected several.

From "A Treatise on Practical Surveying and Topographical Plan Drawing," by Lieut. Siborn, London, 1829, plate 3, I have also selected several*.

* Those signs which I could not find already drawn I have supplied myself—such are the following:—Theatre, Railway Terminus, Railway Station, Barracks, Infirmary, Workhouse, Inn, Tavern, Gas-works, Mud, Martello Tower, Viaduct, Railway Bridge, Tunnel, Bridge over Stream.

MECHANICAL METHOD OF CONSTRUCTING LETTERS AND FIGURES.

EXPLANATION OF THE PLATE.

The horizontal line of dots shown over each line of letters represent certain equal distances, which shall afterwards form one side of a series of squares, trapeziums, or parallelograms; form in the opposite direction a second series of equal parts of similar dimensions to the foregoing, and the means are provided for constructing a long and narrow system, or set of squares, trapeziums, or parallelograms. Now it will be obvious, from an inspection of the accompanying plate, that on such a series or frame-work of geometrical figures, any one may, with the greatest ease, draw, sketch, or fashion out the letters of the alphabet. It need only be said in addition, that for upright letters without *serifs*, squares are best adapted to their construction.

For letters such as the W, X, Y, Z, represented in the sixth line from the top of plate, parallelograms appear to be the best adapted, from the circumstance of the *serifs*, or *tops and bottoms*, exactly fitting into such parallelogram shaped frame-work.

There cannot be a question that the study of this plate will induct the learner better than any other system, into a clear understanding of the forms, proportions, and construction of letters and numerals.

The teacher will do well to construct (in the presence of his pupils) letters and figures after these models, but on a much larger scale, say from two to four inches high.

The pupils in the class should be taught to follow the master in the construction of each letter. The teacher forming the letters on the black board—the pupils on their slates. The great value of this mode of construction for teachers is the comparative ease with which the letters are formed, insomuch that the learner will, as it were, insensibly find himself at once forming well-shaped letters.

Now, were the unskilled learner to attempt to form letters without this *frame-work*, he would fail altogether. But by the means above shown, the outline of the letters can

only be drawn in their *proper places*. The learner cannot mistake *from where to where* to draw his outlines ; the points are marked ready to his hand.

Authorities
for the Construc-
tion of Letters
and Figures.

Some of the examples I have selected from "Memoriale Topographique et Militaire, No. 5, planches 15, 16," some from Lieut. Eastman's work on Topographical Drawing, and some I have designed myself.

Those persons who may wish to be better informed on this interesting subject are referred to "Chapitre 3, Memoriale Topographique, &c.," entitled "Des Caractères et des Hauteurs des Ecritures pour les Plans et Cartes Topographiques et Geographiques." This chapter contains 33 pages of very interesting information.

The chapter above named being of considerable length, precludes the possibility of its introduction in our limited space ; and as part of it would be unintelligible without the context, it has been judged advisable to withhold the entire.

WRITING AND PRINTING.

In this example an unerring principle is laid down, which cannot be too strictly adhered to, especially by beginners. It is for its superior accuracy that I have termed it "the *true* method of forming Titles, &c."

Let it be required to write a Title composed of the following words, viz.:—"Plan of a proposed Extension of the Dublin and Kingstown Railway, from Kingstown to Dalkey."

Unerring
mode of Con-
struction.

The whole
process detailed
in order of gra-
dation.

1st. We should decide on the *size* of the Title we would have.

2nd. The *number of lines* we would have.

3rd. The *style of characters* to be used.

4th. The *Model* or *Trial Title* should be constructed, which, if it suit not our taste when done, can be altered or amended, in writing the Title itself.

5th. The spacing or distance between the lines should be determined on.

6th. Form the lines of writing (in pencil), by putting the centre letter of each line on the centre (perpendicular) construction line of the Title, and working the other letters in the line from the centre to either extremity. Thus we find, by reference to the *Model Title*, that the first line contains seven letters, of which the fourth from the commencement will, of course, be the centre one, and will be placed on the centre line. N is placed in position, and we next (at the proper space which has been previously decided on) put down A, and at another similar space therefrom we put down L. It now only remains (for that side of the line) to put down P, which is placed at an equal space from L as A was from N. Proceed in a similar manner to work from the centre letter N to the right hand, and when the letters are all properly shaped out with a black lead pencil at equal distances, ink them over. When this is done the construction lines may be rubbed out, being now of no further use.

GERMAN TEXT ALPHABETS.

Reason for,
and advantage of
representing the
same characters
of different sizes
or heights.

These Alphabets are given both in large and small, or as printers term them upper and lower case characters, twice over, for the following reason, viz.:—It often occurs in using those characters for the titles of maps that the Surveyor refers to a printed copy for the *shape* of the letters; the printed copies are usually of a *small size*, as that given at the *bottom* of the sheet. When the Surveyor requires to write the characters of a *larger size*, he has to enlarge them, and in nine cases out of ten (I speak from experience) he distorts the shape of the letters in making such enlargement. It is plain that should he have to *reduce* from a *large copy*, he will be liable (more or less) to fall into the same error. By having them of *two such convenient sizes as those here given*, he may surmount the difficulty. Those letters are taken from the best standard models to be found.

OLD ENGLISH ALPHABETS.

To prevent the inaccuracy which often occurs in enlarging and reducing letters from writing books, as well as with a view to save the time required to make such enlargement or reduction, I have given two sizes of both large and small letters here, as in the preceding example. They are selected from the best standard models procurable.

STAINFOIL OR STENCIL PLATES.

This is a very ingenious and convenient method of lettering plans. Draughtsmen who may not be sufficiently skilled in forming letters with the pen are, by their use, enabled to execute this part of the art with the greatest precision and neatness; and if persons are careful to make a good selection in choosing or purchasing the plates, (they may be had, cut to all patterns,) the most indifferent writers, nay, even those who cannot by other means form a letter fit to be seen, may get the credit of good taste and execution. This method is certainly a rich boon to the unskilled. It is presumed that an inspection of the plate will sufficiently explain their use. Fig. 1 represents the *plate*, which is usually made of brass. Fig. 2 represents the *impression*, or letter formed by passing a *brush* (Fig. 3) charged with ink over the plate. Fig. 4 is a *fac-simile of an impression taken from a stencil plate*. It is given here in order to show that *whole words* may be cut in this way, as well as single letters. Fig. 5 shows the stencil plate brush, and the hands with the finger and thumb placed in position. It should be borne in mind that the *fingers* and *thumb* of the *left hand* must be always placed as shown in this cut, in order to prevent the plate *slipping* or *shifting* while brushing in the letter. The *white spaces* which are seen in the *impression* from the stencil plate are caused by the small pieces of brass in these places *stopping out* the ink. These pieces of brass are necessarily left to keep together those parts which are cut out. The white spaces must be made good with a pen and ink. Letters of all dimensions, even to the very smallest, may be cut in this way. The art of stencilling is not a modern invention; it has been for a long time used on the Continent for decorative purposes. The Germans employ this method extensively for painting the walls of their houses with landscapes, figures, &c., and excel in producing by this means a very good effect. I would here suggest the extended use of stencil plates for colouring drawings where large numbers are required. I have coloured many of the drawings in this book with stencil plates, and have thereby saved a vast deal of valuable time and labour. In most cases it is impossible to tell where they have been used, even on the closest examination. Stencil plates of letters may be had in London of any of the wood letter makers. The best I have seen I had made at the establishment of Mr. Bentley, No. 234, High Holborn, by whom I had the plates cut for colouring my drawings; also many sets for the different styles of lettering used on maps.

Since writing the foregoing description of stencil plates I have found the *following*

Stencil plates
valuable to those
who cannot write
by the ordinary
means.

The great
utility of stencil
plates to persons
deficient in writ-
ing.

Stencilling not
a modern inven-
tion.

May be used
for colouring
drawings.

Where they
may be had.

description of what I believe to be a similar contrivance for lettering, in that valuable work, “*Spectacle de la Nature*,” or *Nature Displayed*, vol. vii. page 108.

OPENED CHARACTERS.

“One may write with types of pewter, lead, or brass, which being perforated and applied to paper, are made use of in drawing with a pencil, and in what colour you please, figures agreeable to the apertures of the metal. This writing, though long and tedious in the practice, is nevertheless of some value, on account of the very great neatness it may procure in the performance. We are obliged for it to the ancient Monks, who used to get their livelihood by copying of books. This method was chiefly used for title pages and initial letters.”

I have no doubt but that the *opened characters* here spoken of are identical with the stencil plates used in the present time, especially as it is given as *one of four methods used in the practice of writing*.

I have long and diligently searched for an authentic account of their first introduction, but without success until now. That part of the foregoing extract from *Spectacle de la Nature*, which says “are made use of in drawing with a pencil, and in what colour you please, figures agreeable to the apertures of the metal,” appears to sufficiently identify those opened characters used by the monks of former days with our modern stencil plates.

DESIGNS FOR FLOURISHING.

It is often desirable to use flourishes in embellishing titles on maps. With the view of assisting draughtsmen, a number of flourishes of different shapes are given in Plate "DESIGNS FOR FLOURISHING." It is presumed that their *position* on the sheet will in some measure point out the method of using them. As a general principle in flourishing, it may be observed that the flourishes on *one side* of a title should *balance* those on the *opposite side**; that is to say, the flourishes on either side of a title should be of an equal bulk and corresponding proportion and shape, as in example

Fig. 4.



Flourishes may be used on handsome estate maps, and on engraved maps of countries, &c. They should be displayed in proportion to the degree of finish bestowed on the other portions of the map; and while they give a grace and elegance to the title, if used in *moderation*, care should be taken to prevent their having *too prominent* an appearance. They should not *protrude* themselves on the attention of the observer, but should be so interwoven with the writing as to harmonize therewith. *Perfect freedom* in their formation is indispensable. The art of forming flourishes with one dash of the pen may be easily acquired by practice, and as easily lost by neglect of it. The best flourishes I have seen were formed in this way. An old and worn quill pen, with a broad nib and long slit, is the best for forming flourishes in the way just named, and which may be termed *free hand flourishes*. As no draughtsman can be in the constant practice of forming *free hand flourishes*, it becomes necessary to resort to mechanical means for their forma-

Free hand
flourishing, how
performed.

Mechanical
formation ex-
plained.

* Although it is desirable that the quantity of flourishes on either side of a title should be equal in the aggregate, it is by no means essential, or in keeping with good taste, to have the exact flourishes repeated at either side in every case; this would, on the contrary, produce a very unpleasing effect.

Freedom acquired by Tracing.

tion. I shall endeavour, before quitting the subject, to give an example of the method of forming flourishes by means of *construction lines*. The draughtsman who is totally unacquainted with the art of flourishing should practise by copying the plate "Designs for Flourishing." The best way he can at first copy them is to *trace* them; he will by this means acquire a certain freedom of execution. It is recommended that the first, second, or third tracing made be not very finely or carefully done; rather endeavour to *shape* the thing properly than to produce very fine and nicely tapering lines. But as it will not be sufficient to be only able to trace them, we must endeavour to arrive at a method by which we can *shape them out for ourselves*—first from a pattern, and afterwards without such.

As a first step to the construction I would recommend a simple flourish to be selected from the aforesaid sheet, as in example, and let certain construction lines be ruled upon it as seen in Fig. 5. The learner will perceive how a certain *frame-work* may be made, on which to construct the flourish selected. Having drawn the frame-work on the flourish itself (with a soft pencil, which may be easily rubbed off), he should next construct a similar frame-work, and on it sketch the flourish in a similar position to that represented in Fig. 5. In Fig. 6 the flourish is represented as sketched lightly, and ready for inking over between the double lines. This is a tedious operation, but may be much expedited, like other parts of mapping, by doing it in a systematic manner. It is essential to bear in mind that the pencil lines must not be inked over till the flourish is carefully sketched and proportioned. Special care must be taken to avoid all appearance of *angles* on flourishes. An easy flowing flourish is a perfect illustration of the line of beauty. Let us suppose that it is required to form two such flourishes as

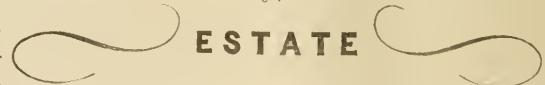
Fig. 5.



Fig. 6.



Fig. 7.



System of balancing the flourishes explained.

have only to make a tracing of it, and transfer it to the other side of the word. The tracing in this case will be reversed, and may be transferred in the ordinary way with black paper. See Fig. 5, "Plate of map drawing, showing the different stages, &c."

COLOURS, No. 1, &c.

Before entering into a detailed account of the application of the different colours to the colouring of plans and drawings, it may be well to make the reader acquainted with the various sources from whence pigments or colours are derived.

The term *pigment* may be defined as any substance used as a paint or colouring material; thus all earths from which colour is derivable may be denominated pigments. Explanation of the term Pigment. Colours are obtained in large quantities from animal, mineral, and vegetable products.

It would exceed our present limits to give an account of the preparation of the many colours used in modern art, and it is not likely that many draughtsmen would be at the trouble of perusing such an account. Nevertheless, a reference* is given which will enable persons so disposed to inform themselves fully on a subject of so much importance to those who would excel in their use.

To come at once to the *use* of colours as we find them ready prepared by the colour-makers, let us first consider what colours we have at our command. The prepared cake colours submitted to the artist for selection may be classed as *blues, reds, yellows, greens, purples, browns, orange colours, blacks, and whites*. From inquiries which I have made of colour-makers, I find there are about 90 different colours. I say *about* 90, some of which differ very little in the resemblance they bear to each other. I believe it very possible to extend this list considerably. In the sheet of "Colours, No. 1" a table of 36 colours is given; on examination it will be found that each of them may be usefully employed in the colouring of plans and drawings; and on further examination it will be perceived that many of them may be dispensed with by the mixture of two or more of different sorts.

To show the different *force* which may be produced by different depths of tint of the same colour, I have (in some cases) given three distinct washes or tints, as will be seen by referring to the plate above named.

Although this plate is already partially explained by the remarks placed underneath each colour, I shall endeavour to state more fully its use.

Reference to the authority for the Preparation of Colours.

Number of cake colours.

* See article Colour-making in Encyclopædia Britannica, Vol. 5

The four blues here shown are selected from a list of about ten, rejecting the remaining six, not from their inferior quality as colouring substances, but simply because those selected will, in *most cases*, supply the wants of the class of draughtsmen for whom this work is intended.

The blues selected for use are—

Prussian blue.

Indigo.

Antwerp blue.

Cobalt.

Now to account for the foregoing selection; it may be observed that *Prussian blue* is found to be a “deep-toned brilliant blue, slightly bordering on green.” Its natural tendency to a green tinge renders it well adapted for admixture with yellow to form a green; when mixed with gamboge it forms a bright green well suited for *flat washing maps*, or *plots of grass land*.

Indigo.—This colour, although belonging to the same class as the *Prussian blue*, presents so widely different an appearance to it, that it may almost be used alongside of the latter by way of contrast. Although a clear colour, it wants altogether the brilliancy of the Prussian blue. Should it be necessary to place two greens alongside each other, a green may be formed by mixing indigo with gamboge, or with any other yellow, which will be quite a different green, and form a contrast to that made by mixing Prussian blue with gamboge or any other yellow. Indigo is generally used for colouring iron in mechanical drawings. It is for this purpose used in its pure state, and is washed over the drawing after the *shadows* have been put in with Indian ink. Indigo is also used in cases where it is necessary to show a difference in drawings between those parts which represent *cast* iron, and those which are *wrought* iron. *Cast* iron is coloured with *indigo*, *wrought* iron with *Prussian blue**.

Uses of Indigo.

The slated roofs of houses may be washed with indigo.

Antwerp blue is a deep transparent blue; it has not the same degree of intense lustre as the Prussian blue; it has naturally a green tinge, and in the absence of Prussian blue may be used as a substitute for that colour.

* See Index of Colours, plate, “Engineering drawing, Details of rails and chairs, &c.”

Cobalt blue is a pure light azure blue, nearly transparent in its light washes. This colour is *quite permanent*; many draughtsmen use it in preference to Prussian blue for colouring water on maps, and for other purposes where Prussian blue is usually employed in an *unmixed state*; but it must be borne in mind, that from the fact of cobalt having a natural tendency to an azure or purplish tint, it is thereby rendered unfit for mixing with yellow to form green; while, on the contrary, its natural azure tendency makes it a fit blue for mixing with lake or other reds to form purple. In using Prussian blue a difficulty frequently arises in getting it to flow freely and evenly. In colouring large portions of water on plans this is very inconvenient. Cobalt is certainly much more easily laid on evenly, and there is a greater facility in *softening it off**. Prussian blue is deficient in this last respect—there is no certainty with it; and frequently, after taking every precaution in mixing, &c., the draughtsman finds to his mortification that on applying the *water brush*, the colour which has been previously laid on, when met by the water, runs back in the most irregular manner, instead of combining with the water in the way to be desired.

Cobalt may be used as a substitute for Prussian blue in its pure state in some cases.

This non-mixing property of the Prussian blue increases in the same ratio as the density of the colour is increased. In order to counteract as much as possible the difficulty above-named, it is advisable, in cases of large washes of Prussian blue being used, to lay it on in two or more light washes; another practice which may be adopted successfully in cases of difficulty is to damp the paper prior to laying on such large wash; this may be done with a sponge and clean water, or with a large hair pencil. In all cases it is essential (in laying on large washes of colour) to have the drawing or sheet of paper inclined at such an angle as will admit of the wash of colour flowing downwards; thus the possibility of a *hard† edge* being formed may be done away with. When cobalt is to be softened off it must not be laid on dark at first, or it will not mix with the water. The non-mixing property of this colour is much less than that of Prussian blue, when both are laid on equally dark or dense.

The four foregoing colours have been explained in order to satisfy the reader that as blues they are the best adapted for his use. We shall now proceed to explain briefly why the blues not given in the table of colours are purposely left out.

* See Glossary of Terms, &c.

† See Glossary of Technical Terms.

Will not mix
with any other
colour.

*Ultramarine** is the purest in tint, and one of the most permanent pigments known; it is nearly free from any tinge of green or purple. This colour is totally unfit for mixed tints; it possesses a certain gritty quality, of which no grinding will divest it; it separates immediately from any colour with which it may be mixed. In cases where it is used (as in miniature painting), it is used in its pure state, and preceded or followed by qualifying tints of the requisite degree of force. Probably enough has been said of ultramarine to show that it should be excluded from our table of colours, as useless to the mapper, engineering, or architectural draughtsman.

Ultramarine-ash is an extremely tender delicate azure tint, not so positive as ultramarine, but it washes better.

More generally
useful than the
real ultramarine.

French blue, or imitative ultramarine, is a valuable colour, nearly transparent, and of a fine strength. It is used in figures, draperies, and landscapes. It has a slight tendency to the purplish hue. This may be neutralized by the addition of a small quantity of Prussian blue, after which it much resembles the tint of the real ultramarine; although not so vivid, it is more generally useful, as it works and washes well. It is permanent in water colour.

*Smalt** is a vivid and gorgeous blue, bright, deep, and transparent, bordering on the violet tint; it is used principally for flowers or draperies, does not wash well, is quite permanent.

Blue verditer is a pale bright blue, deficient in strength of colour; it borders on the green hue. In cases where a blue the furthest removed from violet is required, it is useful.

Formation of a
clear transparent
black.

Intense blue. A preparation from indigo, brighter in tint, and more intense than the latter. Its general usefulness is deteriorated, owing to a salt being inherent in its composition, which penetrates into the paper. It is sometimes used in flower painting; when mixed with sepia and purple it forms a clear transparent black.

From the above description of the six last-named blues, viz.—*ultramarine*, *ultramarine-ash*, *French blue*, *smalt*, *blue verditer*, and *intense blue*, it is presumed that no doubt

* The reason for detailing the properties of colours useless to mappers, engineering and architectural draughtsmen, is in order to prevent time being wasted in attempting to apply those colours which, from the showing are totally unfit.

will remain of their unfitness for the purposes of the Mapper, the Architectural and Engineering Draughtsman. For a further "*application of the colours*," the reader is referred to the many coloured plates given throughout this work as examples of drawing and colouring.

DIVISION OF COLOURS INTO OPAQUE AND TRANSPARENT.

The first general division of colours is, into opaque and transparent. By the first-
named are meant such colours as, when laid over paper, wood, or other surfaces, cover
them fully, so as to efface any other painting or stain that might have been there
before. The transparent colours are such as leave the ground on which they have
been laid visible through them. Both opaque and transparent colours have their par-
ticular uses; the latter are those most proper for colouring maps, architectural and
engineering drawings.

Uses of opaque
and transparent
colours.

DIVISION OF COLOURS INTO SIMPLE AND COMPOUND.

Colours may be again considered as either simple or compound. The simple colours
are such as require nothing to be superadded to them in order to make a full strong
colour, without regarding whether they are formed of few or many ingredients. In
this view white lead, red lead, vermillion, calces of iron, &c., are simple colours. The
compound ones are formed by the union of two or more colouring substances, as blue
and yellow united to form a green; red and yellow to form an orange; red and blue to
form a purple, &c.

A thorough
knowledge of
the primitive
colours leads to
an acquaintance
with the
secondary
colours.

The three primitive colours are *red*, *blue*, and *yellow*. The theory, that by admixture
of these three colours all the compound tints may be produced, appears not only rea-
sonable, but is known to be philosophically correct. It is desirable that learners should
begin the study of colours by the admixture of the primitives, from whence they will
perceive the nature and composition of the "secondary colours," *purple*, *green*, *orange*.
The beginner should be well acquainted with the proportionate quantities of blue and
red requisite to form purples of different tints or hues, and likewise of the proportionate
quantities of blue and yellow contained in certain greens. A thorough knowledge of
the degree of neutralizing power that a primitive colour possesses when combined with
a secondary one, is most important. In the student's early progress he should know
the precise quantity of blue required to destroy orange, or of red to destroy green. It
appears, that although the theory of forming all the compound tints from the three
primitive colours, red, blue, and yellow, is correct; yet, in practice, it is found impossible

to produce the numerous delicate modifications of tints which are met with in nature. The difficulty consists in our not being in possession of pigments of sufficient purity or transparency to form a compound, which shall be free from all turbid or milky appearance. The correctness of the primitive theory may be most readily tested by means of pieces of coloured glass, red, blue, and yellow, being placed over each other.

After what has been said above, it is hoped that some light has been thrown on the subject, and if the *groundwork* of the table of *Colours No. 1* be properly understood, it will be unnecessary to lead the learner through every colour therein contained. A careful perusal of each colour, and the description given underneath it, is earnestly recommended. As some persons examining this plate may yet be at a loss to understand my meaning, I shall still further trespass on the reader's patience. It will be observed, that in the third line of the table three greens are given, which (in the coloured copy) are represented similar, or very nearly so, in tint. My meaning in doing so is, that observing in the list of prepared colours of a celebrated colour-maker, the name of Prussian green, I purchased it, and found, on examining it closely, that it is composed of Prussian blue and gamboge; this latter mixture is given in the next space to the *Prussian green*, in order to show the similarity between the Prussian green sold in cake, and that which any one may form for themselves. It may be useful to many persons to know that they can purchase this colour, by which they may save the time required to make the mixture. In the fourth green compartment a mixture of Prussian blue and raw sienna is given of very nearly the same tint as the two preceding greens. The reason for making this third green similar to the two preceding ones, is to show how one colour may be substituted for another, as the raw sienna is here substituted for the gamboge. The different yellows will be found serviceable in many ways: the chromes, for instance, are highly useful for colouring sandstones. The five blacks will all be found useful, and varying in their application, for particulars of which see the table itself.

Production of
the same tint
by different
mixtures of
components.

COLOURS, No. 2.

CONTRASTS OF COLOUR.

Judging it advisable to have a table of "contrasts of colours" at hand for reference one is here given, consisting of eighteen colours. If the principle on which it is constructed be understood, it will be very easy to extend the limits as occasion may require. To carry out a series of contrasts of colours, such as that attempted in the table, (Fig. 8,) it appears essential that three things be considered, viz.—

1st. How many spaces are required to be coloured.

2nd. How many colours are to be employed for that purpose.

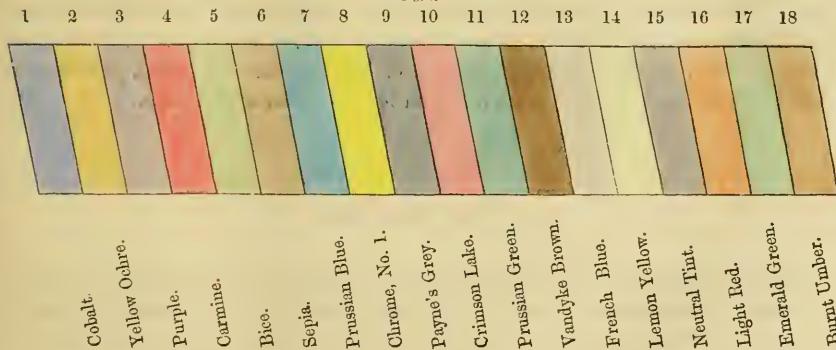
3rd. How the colours selected may be best applied.

For example sake, let it be supposed that we require to colour 18 spaces in such a way that if they be numbered 1, 2, 3, 4, &c., No. 1 shall bear no resemblance whatever to No. 2, 2 to 3, or 3 to 4. As in this case we only require the *neighbouring colours* to be dissimilar, I propose doing it as follows, viz.:—Let us find how many different *classes* of colours repeated a given number of times will make up the number 18, for the 18 spaces to be coloured. The adjoining woodcut will show the method.

COLOURS, No. 3.

OR A SET OF CONTRASTS FOR EIGHTEEN SPACES.

Fig. 8.



It will be seen that six classes of colours are employed, and that the number of spaces being 18, we can repeat each class of colour three times; that is to say, of the class blue we use three different blues, of the class yellow, three yellows, and so with the other four classes of colours—purple, red, green, and brown. In colouring different properties or parcels of land on plans, it is often necessary to use a number of colours to distinguish each property from the adjoining ones. In such cases a set of colours which shall contrast well must be used.

In colouring Architectural Drawings a number of colours are required. Although elevations of buildings are frequently washed or tinted with sepia or Indian ink, these colours will not suffice to show all the internal arrangements of buildings. For instance, sections of walls are usually coloured pink (crimson lake), sections of wood-work of roofs, cross timbers, doors, windows, &c. (in fact all wood-work), a yellowish brown (burnt sienna or raw sienna). The latter is preferable.

Iron-work, as roofs, bolts, tanks, &c., should be coloured with indigo or Prussian blue; for cast-iron use the former blue, for wrought-iron the latter. The three last-named colours are mentioned in this place, because when placed near each other they present a strong contrast.

FRENCH CURVES.

By means of these ingenious implements curved lines may be copied with extreme accuracy, and with precision and firmness, in cases where no regular arcs of circles appear. By their use the difficulty of drawing curved lines by hand is obviated, and thus the draughtsman is enabled to draw an easy even-flowing line, in lieu of a tremulous undecided one. French curves may be had of different sizes and prices, particulars of which will be found written on the left hand bottom corner of the plate.

MAP DRAWING.

Description of
four methods of
producing
duplicate plans.

There are four methods in use among Surveyors for copying or producing duplicates of maps on the same scale; the one in most general use is by *pricking off*, as it is termed. A description of this method will be found farther on. Another method is by making a careful tracing, and transferring it to the paper on which the copy is to

be made, by means of *black paper* placed between. See Fig. 4. Plate, MAP DRAWING. Another method is by means of a well-known instrument, called a *Pentagraph*. For an account of the method of copying a map by means of this instrument, the reader is referred to a "Treatise on Mathematical Instruments," by F. W. Simms. A fourth method is by means of a *copying glass*. For a description of this method, with an illustration of the instrument, see Fig. 7. Plate, MAP DRAWING, &c.

Showing the different stages into which a map passes in copying the original, or producing a duplicate *on the same scale*.

Fig. 1 represents an original map, of which let us suppose a copy to be required on *the same scale*. The first step will be to either "prick off" the map, as shown in Fig. 2, or else to make a tracing, and transfer it, as shown in Fig. 4. By the first process or "pricking off" we obtain a number of minute holes ("needle holes") at all the points and angles of the work; these holes are to be connected, as shown in Fig. 3, by fine pencil* lines. By the second process, viz., *transferring a tracing* of the original map, as shown in Fig. 4, we obtain the outline of the map in pencil, by simply passing a tracing point over the lines on the tracing with a gentle pressure. An examination of the tracing "placed in position for transferring with black, or transferring paper underneath," will better elucidate the process.

It may be well to state here that very great care is requisite in this operation, especially in cases where minute accuracy is indispensable. The process is not by any means so simple as it might at first sight be supposed to be. The least departure from the line on the tracing is of course transferred to the paper on which the copy is to be made, and such errors are almost certain to be magnified in the inking or penning in.

In adopting this method of transferring a tracing, great care is requisite.

Having obtained the outline in pencil, by either of the processes named above, the next operation is *to put it into ink, or to ink it in*. This is done by passing a mathematical or drawing pen charged with ink over the pencil lines, with a pressure sufficient to draw the ink from the pen without cutting the paper. See Fig. 5. The next process is to prepare for the writing.

* Those lines which should in the drawing be done with black lead pencil, are here necessarily represented by fine ink lines.

It would be very desirable that the learner should (before proceeding to arrange letters in the form of lines of writing, whether straight or curved) be made acquainted with the analysis and reconstruction of letters. Our space being limited, unfortunately prevents the subject being treated here. By referring to pages 2 and 3 of a "Manual of Writing and Printing Characters," by the Author of this work, a complete insight, with instructions how to proceed, may be obtained. The Manual is published by Mr. Weale, of 59, High Holborn, for the Author, of whom it may also be had.

Analysis of letters.

The article in the Manual of Writing just referred to is illustrated with many plates, showing, first, the component parts of the *Round Hand* and *Roman Printing Hand*, upper and lower case and numerals; and secondly, the fitting together of those component or analytical parts—that is to say, their placing together in the forms of letters.

Mulhäuser's Analysis.

For the writing text, or round hand, the Analysis of Mulhäuser is adopted, and the formation of the letters from the elements or analytical parts, is proceeded with in the regular order of their simplicity, thereby leading the learner on from the simplest form to the most complex to be found in the alphabet.

The greater portion of the writing on maps should be parallel with the top and bottom edges of Map.

How to insure this parallelism.

The great mass of the writing on maps should be parallel with the top and bottom edges of the paper on which the map is drawn; such writing, for instance, as the names of farms, occupiers, towns, names and numbers of fields, contents, the title, the writing to the scale, &c. In order to insure the parallelism of the writing, it is necessary to rule certain parallel lines in pencil in a horizontal position, and at intervals of two or three inches apart from the top to the bottom of the map, and running entirely across it. These lines should be ruled with a soft pencil; they are represented in the sketch shown in Fig. 5 by very faint ink lines (as substitute for pencil). It will be obvious that with these long parallel lines for guides shorter ones can easily be ruled wherever it is required to place any writing. For this purpose it is only necessary to place the edge of a parallel* ruler along one of these horizontal guide lines, and slide it along till the other edge shall come to the place where the word or words are to be written, when a pencil line can be ruled along such edge; we can immediately proceed in like manner to rule in the remainder. Besides the parallel writing on maps, it will be necessary to have curved lines of writing, the construction of which let us now consider.

* See parallel ruler among the instruments shown on this plate, as required for drawing maps.

THE CONSTRUCTION FOR CURVED LINES OF WRITING ON MAPS EXPLAINED.

Before proceeding further in our enquiry concerning the “construction” for curved lines of writing, let us stop to consider in what cases such curved lines are brought into use. It will be time enough to set about the construction when we are satisfied of its utility, when we plainly perceive the necessity of adopting it. In certain situations (which shall be named hereafter) curved lines of writing are *essential*. They also, when judiciously applied, materially contribute to the *beauty* of maps. If we take a general view of maps, we find them abounding with curved lines of writing. These curved lines are not adopted without their proper meaning (as we shall presently find), but are so formed intentionally for one or other of the following reasons, viz. :—

Fitness of
curved lines of
writing in cer-
tain cases.

Beauty of
curved lines of
writing when
judiciously ap-
plied.

1st. That the writing on crooked boundaries on outlines of maps may *harmonize* with such boundaries, or in other words, as the boundary is curved or contorted, so should the writing be, in order to assimilate with it.

2nd. On irregular or straggling pieces of land, in order to show the extent, connexion, or proprietorship thereof.

3rd. On crooked rivers, lakes, seas, or other pieces of water; also on crooked roads or streets.

4th. In titles of maps, in order to take off the *monotonous* appearance presented by a number of straight lines of writing.

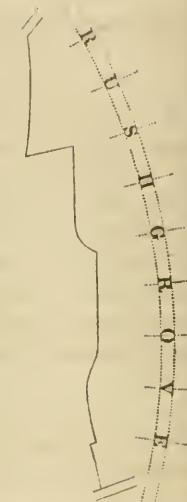
The above-named cases are the principal ones in which curved lines of writing are introduced on maps. If the “construction” be understood for one purpose, it can be easily adapted to the others.

Fig. 9 represents a portion of a crooked boundary or outline of a map, placed in such a position with regard to its proximity to the edge of the paper, as leaves no choice in the determining the *position* of the writing. It must be placed either on a straight line drawn up and down the paper (that is to say extending from north to south), or it must be placed on a curved line. The latter is preferable, as being most in keeping with the shape of the "boundary." Let it be decided that a curved line be adopted; the next step to decide is, whether a regular or irregular curve be used. In this case a regular curve is preferable, and is adopted for a reason which shall be hereafter explained. The curve *d e*, Fig. 10, is an arc of a circle $4\frac{5}{8}$ inches radius. It is drawn at a convenient distance from the boundary. The centre of the space between the points *a* and *b* is determined at *c*, which latter point becomes the centre of the word to be written, and from this point *c* at either side are laid off four equal distances, which are marked by the dotted lines drawn through them. A second arc of a circle is drawn from the same centre, and at such a height or distance from the first arc, to which it will be parallel, as we wish the letters used to have; on the short dotted line passing through the point *e*, the centre letter of the word (which should previously be found by computing) is to be placed. See letter *G*, Fig. 9. The next letter, *R*, is now to be written, and so on to the end of the word; next return, and working back from the centre letter, write all the other letters (placing them on their respective dotted lines) till the first letter of the word shall be written in.

Fig. 10.



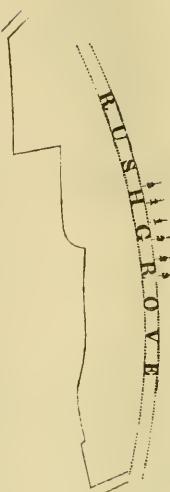
Fig. 9.



OBSERVATIONS ON THIS METHOD OF SPACING.

On a careful examination of the foregoing method of spacing, we find that it is best applied where a long space is to be filled up with a few letters, in other words, where the letters are few and far between; and for this reason, that the letters of the alphabet are of unequal widths, and consequently the *spaces between the letters* by this method will be unequal, although the spaces themselves are equidistant. To obviate this difficulty, another method is resorted to, which is as follows. See Fig. 11. The construction lines for the *width* of the writing are drawn by the same means adopted in Fig. 10. The centre point *c* is found in a similar way, and the centre letter of the word to be written, *G*, is placed at the side thereof. Having formed *G*, an equal distance is to be laid off at either extremity of that letter, 1 1, 2 2. This done, the letters *H R* may be written in, and from each of their outer extremities, 3 3, the same distance, 1 1, is to be repeated; write in *S* and *O*, and proceed in like manner to the completion of the word. By this method we can insure the letters being equidistant, which is essential; but by referring to Fig. 12, it will be seen that in some cases it will not apply to place the centre letter of the word to be written on the centre line of the space on which it is to be written. This is owing to the various widths of the letters. The centre of the *space a b* (in which the word *Inishowen* is to be written) is shown thus. The centre of the word thus *. The remedy is simple.

Fig. 11.



OF CURVED LINES OF WRITING ON VERY IRREGULAR BOUNDARIES.

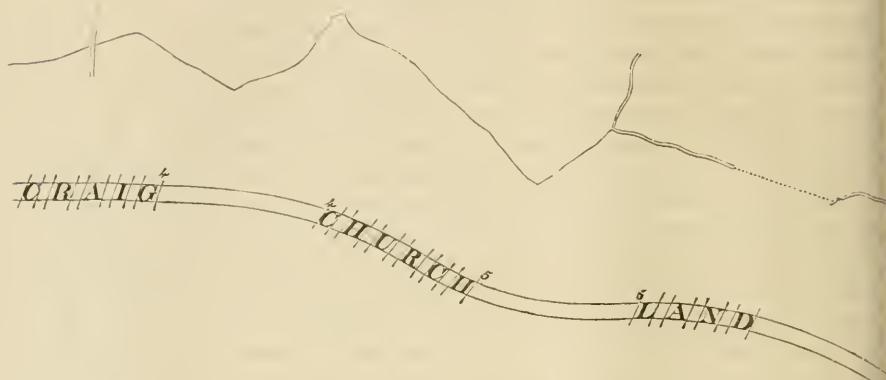
We have sometimes to deal with more irregular boundaries than that shown in Fig. 9. Let us take for example the boundary A B, Fig. 13. In this case it will be necessary to place the writing on an *irregular curve*. Curves of this description may be best formed by one person holding a steel or other elastic ruler into the form desired, and placing it with its edge on the paper alongside the crooked boundary. The elastic ruler must be held in this position, while another person rules or marks with a pencil along it. In this way curves of all shapes may be formed with the greatest ease, and

Arrangement of writing on very crooked boundaries.

How to form curved lines for writing.

possessing a grace and elegance which is scarcely attainable by any other means. This method is no less recommended for the expedition with which it may be practised.

Fig. 13.



In example Fig. 13, the shape of the curred line of writing is adapted to the shape of the boundary, instead of forming a regular course, as shown in Fig. 9. The centre of the letter U is made the centre of the line of writing. The space between the words 4 4, 5 5, is equal to the full width of six letters, with the necessary spaces between them. The width between the words may be varied at discretion, as may the width between the letters.

We would next direct the reader's attention to the two cuts, Figs. 14 and 15, as an example of the fitness of adopting curved lines for writing in certain cases. It will be readily admitted that the easy flowing and graceful curve used in Fig. 15 is preferable in this case to the stiff and out of character looking straight lines shown in Fig. 14.

For an example of crooked writing on rivers, the reader is referred to the "specimen of an estate map." For writing on crooked roads or streets, the rules already laid down will equally apply.

For an example of curved writing in the titles of maps, see the title—"Plan of the parish of Shotisham;" also the title to the specimen of an estate map.

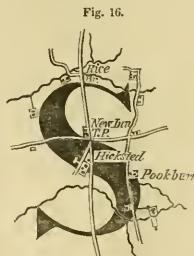
Fig. 14.



Fig. 15.



In engraved maps of counties and large districts, it sometimes occurs that, from the small scale adopted, it is difficult to find room for writing the principal names, as that of the county for instance, which should be written with the largest letters used on the map. Fig. 16 is an example of the means usually adopted by skilful engravers to surmount the difficulty. This is a very ingenious contrivance. By taking proper care, the letters may be prominently displayed, without obliterating the roads, rivers, houses, small writing, &c. This method is adopted in the Ordnance Survey maps of England. Engravers and Lithographers generally will do well to practise it.



EXPLANATION OF A MODE PRACTISED IN THE PRESENT TIME BY MANY DRAUGHTSMEN, WITH OBSERVATIONS.

A very general practice with draughtsmen, in order to expedite the process of writing maps, where the number of words is considerable, is after spacing the letters to make two operations of forming them. It is done as follows:—
 Let it be required to write the word “LONDON.” Fig. 17 **L O N D O N** represents the first operation, or formation of the *vertical lines*. Fig. 18 represents the second operation, or forming the *horizontal and curred* lines*. By this method a considerable quantity of time may be saved, in cases where there is much writing on the map. It renders it unnecessary to constantly *turn the map round*, in order to get it into the *different positions* required for executing the *different positions* of the two sets of lines of which the writing is composed. It also admits of a quill pen being used for a longer time than by the old method. A pen which will do very well for the thick vertical or down strokes of letters, will be much too coarse for the *delicate* horizontal and curved lines, technically denominated “*tops and bottoms*.” This latter portion may be *ruled* in with a *mathematical pen*.

Fig. 17.

Fig. 18.

SPECIMEN OF AN ESTATE MAP.

In this specimen will be found examples of the application of many preliminary plates, some useful specimens of writing, &c.

* The portions of the letters shown in Fig. 18 are called by writing draughtsmen “*tops and bottoms*,” by engravers the *spurs* of the letters, and by type-founders and printers they are called *serifs*.

Uses of italic letters; by engravers and lithographers called *stump* writing.

The italic letter (by Engravers and Lithographic writers called *stump*), is a most useful one for the great mass of the small writing on maps. Of all descriptions of letters this is the most rapidly formed; for this reason it is in general use for the *names* of *fields*, and *contents*, *qualities* of *land*, as *arable*, *pasture*, &c. It is also occasionally used for other purposes, as to produce variety in the boundary writing, and sometimes in titles. It may be used of different sizes, according to the purpose for which it is used. See *W. A. Morland, Esq.*, under PARISH or HORSEMONDEN at the top of this map.

The lower case roman hand, with capitals for the first letters of words is frequently used for writing the names of farms, as “**Grantham Hall Farm**,” &c. The object is to form a contrast with the *italic* or *stump* last spoken of; this produces a very pleasing effect.

The names of adjoining lands and occupiers may be written in various hands, as shown in this example. As a general rule, we should endeavour to write these last-named portions as much of the same height as possible: the names of lands adjoining may, for the most part, be formed of roman and italic capitals. In cases where the names of such lands are numerous, recourse may be had to *embellishing* the *letters of some of the words*, for variety sake.

In resorting to this practice we should be guided by judgment and discretion. My meaning will be understood by referring to the plate, where it will be seen that the embellished words,

P A R I S H O F H O R S E M O N D E N.

at the top is balanced at either side by a *plain line of writing*, viz.—

P A R I S H O F L A M B E R H U R S T.

at one side, and

P A R I S H O F L A M B E R H U R S T.

at the other side.

This is a much better arrangement than to embellish one of the plain lines of writing at either end or side of the centre one; on the other hand a different arrangement might as happily be resorted to for effect sake, which would be to embellish *both the plain or side lines*, and to leave the PARISH OF HORSEMONDEN plain in the centre. In the case as it stands we have less labour, and it may be questioned whether the effect produced is not quite as pleasing as it would have been with the other arrangement just spoken of. The scale should (when practicable, as in the present example) be drawn in the centre of the space underneath the plan.

OF THE COLOURING.

Colour is used on maps of this class for one or more of the following reasons, viz.:—

Roads are coloured with *burnt sienna*, or a mixture of *burnt sienna* and *yellow ochre*, or some other warm colour, bordering on the same tint. Rivers, ponds and lakes, and other pieces of water, are usually coloured blue.

After repeated trials of many colours, I am inclined to give the preference to *cobalt* for this purpose, it is more easily worked or laid on evenly than *Prussian blue*; but it is deficient in point of brightness. Different colours are used on maps to distinguish different properties. In some cases (as on plain maps) this is effected by means of an *edging* of colour being placed round each portion of land meant to be distinguished; on coloured maps (see the same example in the *coloured copy of this book*) a wash of colour is placed entirely over each separate piece of land. In doing this it is very desirable that a contrast should be produced, which will more clearly point out such division than if colours of the same tint were used. The four colours used to point out the four different properties on this map will serve as an example of the effect of contrast of colours. For further information respecting contrasts, the reader is referred to the table colours, No. 2, or a set of contrasts for 18 spaces.

Maps of this class are also coloured after nature, or in imitation thereof (see the highly-finished copy of this book)*. This is sometimes done when a gentleman or owner of land desires to have a handsome map or set of maps of his estate. It is also done

Colour proper
for roads.

Colour proper
for water.

Different pro-
perties or
parcels of land
distinguished by
different
colours.

Contrast of
colours, applica-
tion of.

* It is intended to produce a few copies of the Hand-Book for Mapping fully Coloured in the most careful manner, under the Author's immediate inspection, which will be offered as perfect models for draughtsmen. As the production of those highly-finished copies must necessarily be a tedious operation, the Author begs to state that they cannot be ready for delivery before the 1st day of June next.

by or for auctioneers, for the purpose of displaying or setting off to the best advantage landed property which they are employed to dispose of

The various purposes for which colours are used on such maps as the "Specimen of an Estate Map" having been explained, it may be observed that colours are used on several other descriptions of maps, of which in their proper places.

MATHEMATICAL DRAWING INSTRUMENTS.

The Compasses.—Fig. 1 represents a pair of compasses or dividers. Without minutely detailing the many applications of this instrument, it may be stated generally that its principal uses are to determine by measurement the distances between given points, to lay down or plot certain points and distances, and to describe circles *.

The Hair Compasses.—Fig. 2 is constructed in the same manner as those described above. This instrument is an improvement on the common compasses, inasmuch as by means of a screw and spring inserted half way down one limb, the lower or point half of such limb can be moved a very small distance either towards or from the other limb, which meantime is stationary. The smallest distance may be measured or laid off with greater precision than with the common compasses.

Fig. 3. A large pair of compasses, with a moveable leg to admit of replacing it with a pencil, pen, or dotting point. The pencil point (Fig. 5) is a tube made to hold a piece of black lead pencil, and is used for describing arcs or circles not meant to be permanent. The pen point (Fig. 4) is used for drawing circles or arcs with ink. The dotting point is used for drawing dotted circles or arcs with ink. This is effected by filling the drawing pen into which the dotted point is fixed with ink, and as the wheel (which is constructed like the rowel of a spur) passes through the ink it takes up ink, and discharges it in the form of dots on the paper. For a drawing of this instrument, see Simms's Book on Mathematical Drawing Instruments already named, also Edinburgh Encyclopædia, Vol. VIII. part 2, plate CCXXXVII.

* For a more detailed account of this and the other drawing instruments, with the method of their construction and manufacture, the reader is referred to a Treatise on the principal Mathematical Drawing Instruments employed by the Engineer, Architect, and Surveyor, by F. W. Simms. Published by Mr. Weale, 59, High Holborn. Price 2s. 6d.

A lengthening bar (Fig. 6) is sometimes used when it is required to strike larger circles or arcs, or measure greater lengths, than could be performed by the compasses without this additional limb.

Wholes and Halves.—Fig. 7. This is a very useful instrument; it is so constructed that a distance taken between the points at the small end is found to be exactly double at the opposite end; and, *vice versa*, as the distance measured at the large end is found to be exactly half at the opposite end of the instrument, it is very useful for dividing lines into any number of equal parts.

Triangular Compasses.—Fig. 8. Without entering into an explanation of the construction of this instrument, it may be briefly stated that by its aid any three points may be transferred from one piece of paper to another. It is very useful to Surveyors for transferring triangles. It is also found serviceable for expediting the process of copying mechanical drawings.

Tube Compasses, or Brunel Compasses.—Fig. 9 represents a very ingenious contrivance for describing circles of large and small diameters. An instrument of the size here shown is capable of describing circles of from $\frac{1}{8}$ of an inch to $14\frac{1}{2}$ inches radius. Their invention is attributed to Mr. Brunel.

The Double-Jointed Bow Pen.—Fig. 10 represents an instrument of very great utility. On examination it will be perceived that the upper limb carries a needle for its point; this prevents the possibility of large holes being made in the paper. This is a great convenience, especially when a number of circles or arcs have to be struck from the same centre.

The Double-Jointed Bow Pencil.—Fig. 11 represents an instrument of similar construction to the last-named, except that in one limb a pencil is placed instead of a pen.

Spring Dividers.—Fig. 12 is particularly useful for repeating divisions of a small but equal extent. The upper part, forming the handle, is made of brass or silver. The lower part is one piece of steel, out of which the two limbs are cut; thus a tendency to recede from each other exists, which is counteracted by an adjusting screw.

Bow Compasses.—Figs. 13 and 14 are so constructed as to admit of much smaller circles being struck with them than could be accomplished with those already described, viz., Figs. 10 and 11. They are like the spring dividers, cut out of one solid piece of steel.

Fig. 15 represents a very useful appendage to a case of mathematical instruments ; it consists of a knife, file, key, and screw driver.

Fig. 16 is (I believe) an instrument of French construction or introduction. A spring is inserted in the tube part of the instrument, on which the joint plays, so that when pressed against any surface, as paper, it has a tendency to recede towards the top part of the instrument, or within the tube, a very valuable property, and which protects the paper from having holes of large size made in it. This instrument is used by some lithographic draughtsmen.

Drawing Pins, or Drawing-Board Pins.—Figs. 17 and 18 represent two views of a drawing pin ; they are used to fasten paper to the drawing board, and are more convenient, especially for small drawings, than weights.

Drawing Pens are made of different constructions. The pen represented by Fig. 19 is one of a good construction, inasmuch as the blade being cut out of a solid piece of steel, a steadiness is obtained which is wanted in Fig. 20. It will be perceived that at the end of the blades of this pen next the handle there is a joint ; this is placed here for the greater facility of cleaning the pen.

The Double Drawing Pen (Fig. 21) is a useful instrument in cases where lines of two thicknesses are constantly required, as in drawing plans of towns, also for other purposes.

Fig. 22 represents a *gold pen**, constructed or invented by Mr. John Isaac Hawkins. The ends of the blades intended for drawing with are made, as we are told, of “*native alloy*, which is as much harder than rhodium, as steel is harder than lead, will endure longer than the ruby—yields inks as freely as the quill—is as easily wiped, and if left unwiped is *not corroded*.” The handle is made of silver, and is so constructed that it forms a case to protect the blades of the pen when not being used. Some few draughtsmen use it for drawing on stone and zinc. It unfortunately does not come within the reach of all. The price is £2 15s.

The Dotting Pen.—Fig. 23 is a species of drawing pen used for drawing dotted lines. The dotting wheels, which are made of various patterns, are very useful for rapidly and neatly producing dotted lines.

* This instrument may be procured at Mr. Lund's, cutler, 24, Fleet Street.

The Road Pen.—Fig. 24 represents the road pen, a most useful and economical instrument in practised hands. Its use is obviously to draw two lines at once. To do this properly the instrument must be neatly made, and the points set most carefully.

The Pricker or Needle Point.—This is a generally useful instrument for all purposes of plotting, protracting, &c. It is often used in copying drawings, especially maps. See article, Map Drawing, further back.

The Proportional Compasses.—This instrument is of such use in enlarging and reducing drawings, that no draughtsman should be without it; whereas the instrument denominated “Wholes and Halves” only admits of enlarging or reducing to one measure. This instrument enables us to increase or diminish to eight times the size of the original, or to one-eighth of it, as the case may be. For a more particular book description, the reader is referred to Mr. Simms’s book, already spoken of. Its use, however, will be best understood by the learner possessing himself of the instrument. It need hardly be stated that if a person be possessed of the *Proportional Compasses*, he will not require the *Wholes and Halves*.

Turn-in or Pocket Compasses.—This instrument may be said to comprehend within itself a complete case of drawing instruments. When all the parts of which it is composed are put together, it forms a *large pair* of *compasses* (Fig. 27). This is resolvable into a *pencil bow*; (Fig. 28) a pen bow; (Fig. 29) a drawing pen. The point of Fig. 29 a drawing pencil, by placing a piece of pencil in the pencil case limb of Fig. 28; a pricker, the sharp point of either Fig. 28 or Fig. 29.

RAILWAY PLAN DRAWING.

SPECIMEN OF THE METHOD OF DRAWING A PARLIAMENTARY PLAN, WITH FULL PARTICULARS OF THE ESSENTIAL POINTS TO BE ATTENDED TO IN THEIR CONSTRUCTION OR PREPARATION.

Standing orders
of Parliament
relating to rail-
way plans.

Railway plans do not essentially differ from other plans, except it is in their being (generally speaking) less accurate, in consequence of the surveys being usually got up in great haste, and often by an inferior class of surveyors. By the standing orders of the House of Commons, Engineers and Surveyors are required to plot their railway plans at a scale of not less than 20 chains to an inch. The example here referred to is plotted at a 20-chain scale. The width of railway surveys varies from 5 to 20 chains, at the option of the Engineer. One very essential point to be attended to is to carefully survey, plot, and number all houses, fields, &c., within the *limits of deviation*. The *limits of deviation* are certain lines which mark the space beyond which it is not proposed to take power to deviate the line of railway. The limits of deviation are shown by a strong dotted line,—the proposed railway line is represented by a strong line.

When railway plans are drawn at a scale of 20 chains to an inch, it is usual to give enlarged plans of those subdivisions of land into very small allotments, as gardens, houses, &c., such subdivisions being often rendered indistinct, from the smallness of the scale. The principal object of these enlarged plans is to enable the draughtsman to sufficiently develop the houses, &c., both by drawing and numbering; a separate number being required for each garden and house, as well as for all fields, roads, rivers, &c. The names of the different parishes through which the line is proposed to be carried must be written, and of late days the *county name* is placed at the top of each sheet. The sheets are numbered 1, 2, 3, &c., and the name of the line of railway is sometimes written over the number of the street, as Elverton, No. 1. The enlarged plan should be placed in each case directly over or under that portion of the small plan to which it refers. By taking care to get the portion of the railway line on each enlarged plan exactly parallel to the corresponding portion of railway line on the small plan, a very pleasing and convenient arrangement will be effected, and we are thus enabled in using the plan to find at once the enlarged portions. I have been induced to say so much for the guidance of the young surveyor, from having frequently noticed the slovenly manner in which some surveyors are in the habit of misplacing the enlarged plans. They are sometimes so jumbled together that it is quite a labour to wade through them. The radii of the curves in miles and furlongs is required to be

written in each case where curves occur. When the plan is drawn at a scale of 20 chains to an inch, the enlarged plans are usually plotted at a scale of 5 chains to an inch. Proportion of the enlarged parts to the general plan.

The scale of 6 chains to an inch is one frequently adopted for Parliamentary railway plans ; but they are seldom drawn to a larger scale than 5 chains to the inch. The relative merits of the large and small scales may be fairly taken as follows ; viz., when the survey has been carefully taken, the scale cannot be too large; but if it be carelessly done, as is too frequently the case, it becomes necessary (as it is technically denominated) to *fudge* it, and in such cases it is frequently plotted or reduced to a 20-chain scale. This is done with a view to obscure, as much as possible, the inaccuracies of the survey. The merits of the large and small scales may also be taken in another light, viz., when there is a sufficiency of time to admit of plans being drawn at a large scale, it is desirable to use it, but if the time be short, the work will be sooner done at a small scale.

Again, for the duplicate plans ; this becomes a consideration. Lithographers charge a less sum for lithographing and printing plans at a small scale, than at a large one. Lithography has of late years become a very favourite medium with Engineers and Surveyors, for the production of duplicate plans for Parliamentary deposit. It certainly has much to recommend it, and in proper hands, it would be a most invaluable medium. It is to be regretted that this art, (as applied to the purpose above named,) almost essential to the surveyor, has fallen into the hands of an ignorant class of persons, viz., the picture-copiers and lithographic printers. It were impossible to detail the mischief annually done by persons being intrusted with this class of business, who are totally ignorant of the construction or use of maps. The numerous railway schemes brought before Parliament during the last two sessions have compelled engineers and other persons intrusted with the getting up of plans and sections to employ a miscellaneous collection of persons, who had never before been similarly engaged. A proportionate amount of mischief has been the consequence. It is painful to see even the professed picture-copiers or lithographic artists attempt to copy plans. The most ridiculous blunders are made, as might be expected ; but of this no more. The remedy is simple ; at least the evil may, to a great extent, be lessened, if not altogether removed. Let Surveyors lithograph their own plans, or employ their draughtsmen upon them ; much time and expense would thus be saved. The picture-copiers and lithographic artists would no longer have their brains addled with pursuits above their capacity ; and the lithographic printers would have the plans put into their hands in a perfect state, instead of being obliged to send them back to the lithographic ignoramus for every alteration of his blunders required to be made by the Engineer, on examining proofs. In fact, by the method recommended above, the necessity of proving may be in a great measure dispensed with.

SPECIMEN OF THE METHOD OF DRAWING A PARLIAMENTARY RAILWAY SECTION.

This is a section of the foregoing plan, and is prepared in compliance with the standing orders. It may be used with every confidence as a MODEL for future productions being a portion of a section which I had lithographed for Parliamentary purposes. To prevent disappointment to those persons who may expect a *better style of drawing*, it may be well to state, for their information, that it is *purposely* done in the style in which such drawings are usually, or ought to be prepared. The principal point to be attended to in getting up such drawings is to draw them accurately. There is seldom time for pains-taking with embellishment, and the plainest style of execution is quite as useful as the most elaborately finished production.

OF ENLARGING AND REDUCING MAPS AND DRAWINGS.

A very well known and accurate method of enlarging and reducing Maps and Drawings, is by means of squares. Let it be required to reduce Fig. 1, Plate B B., to half the size. First, construct on the given figure a series of squares of any even measure, as an inch each; next, construct a like number of squares of half an inch long, and on these last, or small squares, measure or draw in the work, as in Example Fig. 2. Another method by which the same operation may be performed, is that shown in Figs. 3, 4. As this method may not be clearly understood without explanation, being now for the first time introduced, I shall endeavour to describe it. Let it be required to reduce Fig. 3 to half the size. Select any point, as F, outside the figure. From the point F, draw straight lines with black lead pencil, through all the points or angles of the figure, as a, b, c, d, e, f, g, b, i, j, k, l, m, n, o, p, q, r, s, t, u, v. Next plot or lay off upon the pencil lines half the distance between the point F and each of the points or angles of Fig. 3, which half distances are represented by the figures 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26. Connect these last-named points, as shown in Fig. 4, and a drawing will be produced being in every particular half the size of Fig. 3. This may be satisfactorily proved, either by measuring each boundary line, or by measuring diagonal lines, as those laid out for that purpose on Figs. 3, 4, and shown by a long and short dot.

To enlarge Fig. 3 to double the size, produce the lines connecting the point F with all the points or angles of Fig. 3, till you can lay off double such lengths, as F G, F H, &c. Mark such points as are shown by the crosses on Fig. 5, connect these last-named points, and Fig. 3 will be enlarged to double the size, as represented by Fig. 5.

By producing the construction lines to the left of the point F, a second series of construction lines may be formed upon which *reversed* copies may be drawn. This method of enlarging and reducing is best suited for drawings in which the lines are for the most part either straight or regularly curved. It will be found very serviceable by those who are not possessed of a pentagraph, for a description of which instrument the reader is again referred to Mr. Simms's book.

The extreme accuracy of the method introduced above, induced me to apply it in practice; and I had two parish plans of considerable magnitude reduced in my office. At first it was found troublesome, especially where much small work had to

be dealt with ; but after a little time the draughtsman preferred it to any other method. I hope to treat this subject more fully in the second edition, and to introduce an instrument which I am at present constructing to facilitate its general adoption.

The lines which as stated above should be drawn with a black lead pencil, are represented in the accompanying drawing by finely dotted lines.

WORKING DRAWINGS.

BRIDGE UNDER RAILWAY.

THE accompanying diagram represents an example of a working drawing of a railway bridge, and is of a similar character to those prepared by the engineer directing the works, for the use of the contractor.

It will be observed that in order to economize time and space, but half of the plan, section, and elevation is shown; this practice (to those who are accustomed to *read* drawings) is found convenient from its being so concise; but the student on commencing his studies should avoid this practice, from its liability to confuse and lead him into error; he should invariably make each of the requisite portions of his design separate and complete in themselves.

DIRECTIONS FOR MOUNTING PLANS AND DRAWINGS.

By mounting plans and drawings is meant the pasting them on linen. This practice is resorted to in cases where plans and drawings are likely to be much used, in order to preserve them from being torn. Plans and drawings which have not been thus preserved in the first instance—that is to say when first made—are frequently so much injured by continual use and other causes as to render it necessary to finally resort to this practice in order to preserve them from further decay. It is very usual to plot surveys on mounted paper, but it would be very imprudent to mount plotted plans after plotting, inasmuch as the operation of mounting (as will be shown hereafter) would alter

Uses. the scale of the plan very materially. If it be determined to mount a plan, drawing, or tracing on which colour is to be used, it were better not to apply the colour till the drawing or tracing shall be not only mounted on the linen, but perfectly dry also. Were the colour laid on before mounting, it would be liable to be *started* or *smudged* during the operation; but by laying on the colour before removing the mounted drawing from the board, it may be laid on in perfectly even washes. The process recom-

Of the colouring. mended is as follows, viz.:—Stretch a piece of linen evenly over a board of sufficient size to admit of a margin being left of about two or more inches all round; stretch the linen perfectly even, so that not a crease shall appear; now take the drawing and turn the *face* on to a perfectly clean table, dip a sponge into a basin of clear water and wash the back of the drawing over evenly, taking care not to omit wetting the least portion. If the paper be thick, the sheet may be allowed to remain soaking for five minutes. The paste may be applied as soon as the water shall dry off the paper, but not sooner, as otherwise the water mixing with the paste would impoverish the latter and prevent its holding the drawing to the linen. When the sheet shall be completely stretched, it may be placed on the linen in the following manner:—Let the board containing the linen meant to receive the drawing, be tilted or slanted forward in such manner that the top shall considerably overhang the bottom; let the top edge of the drawing be hung or stuck on to the top edge of the linen—which may be effected by a gentle pressure of the hand;—having well secured the top edge of the drawing, the assistant still holding the board in the inclined position, take hold of the drawing by the bottom corners, and laying it out evenly over the linen, fasten the corners with a gentle pressure of the hands; next fasten the drawing in the centre, lay a clean sheet of paper over the entire drawing, and with a soft cloth or silk handkerchief rub hard, so as to make the drawing adhere to the linen in all parts; continue the operation of rubbing for some minutes;

Directions for mounting.

now lean the board against the wall, and let it not be exposed to too great a heat, but in a dry situation. If left on all night you may proceed to colour it the following morning; let it remain after this a few hours on the board, when you may cut it off. Tracings on *common tracing paper* may be pasted at once without first wetting them with water to stretch them, but *French tracing paper* must be wetted and left a few minutes to soak, like drawing paper. This paper stretches very considerably, and, like drawing paper, if laid on the linen before being allowed a proper time to stretch, it will abound in blisters and be very unsightly. This kind of tracing paper, on being first wetted, rolls up; but on being left soaking a few minutes, will come perfectly even.

INSTRUCTIONS FOR LITHOGRAPHING PLANS, SECTIONS, AND DRAWINGS.

MAKE a tracing of the plan or drawing to be lithographed, measure the size of it ; you may procure at any of the lithographing establishments a stone of the required dimensions properly prepared for drawing on. Turn the tracing upside down, or with its *face next the stone* ; place between the tracing and the stone a piece of red paper, called transfer paper, (which may also be procured at a lithographer's office,) transfer the tracing to the stone with a tracing point, take up the tracing and you will have the outline in red, on the stone ; now line it in with lithographic ink ; you may use the mathematical pen for ruling the straight lines, the crooked ones must be done with a very fine-pointed *brush*. For persons commencing this sort of drawing, it will be desirable to engage a lithographic plan draughtsman, who will procure all the necessary implements of the proper quality. A precaution should be attended to, viz., to keep the lithographic drawing as much apart as possible from the drawing on paper. It frequently occurs, where both are practised in the same office, that the uninitiated will use Indian ink for drawing on stone, and vice versa. It is desirable, if possible, to have the lithography done in a different room. A surveyor's draughtsman should not be disappointed if unsuccessful in the first attempt, as allowance should be made for getting to work in a new branch. It is certainly very desirable that plans, architectural and engineering drawings, should be lithographed by, or under the superintendence of those persons who design and plan them. In the present day there is no scarcity of lithographic draughtsmen well trained in the manipulation of the art. Being for the most part mere copyists, a considerable amount of mischief is annually done (as has already been observed), by entrusting the getting up of this class of drawings solely to the hands of lithographers. The necessity for rigidly complying with the essence of the "standing orders of the House of Commons" should be a sufficient stimulant to engineers and surveyors to have this class of business performed under their own superintendence. They should recollect that as gentlemen, and having their characters at stake, they are bound to study the interests of their employers ; and that in the present state of things they are bound to look closely into this important branch of art. The author of this book being personally known to many most respectable lithographers, would have it understood that he speaks disinterestedly in his advice to engineers and surveyors, and he regrets being obliged to declare his belief that very few of the many lithographers are sufficiently conversant with the *construction* or *application* of maps in practice to warrant their being intrusted with the

Transferring the drawing.

Lithographic brush.

To be done apart from other drawings.

Lithographed plans should be superintended by surveyors.

entire charge of preparing them. Those who feel themselves competent will not have to repine at any observations here offered, and no offence being meant to any one, it is hoped none will be taken. But setting aside the foregoing remarks, it may be observed that to the author's own knowledge many engineers and surveyors have of late years resorted to the practice of employing lithographic draughtsmen in their offices, and this practice is, as it should be, on the increase. With regard to the printing, the case stands very different: this art has arrived at a very great degree of perfection in this country.

INSTRUCTIONS FOR ZINCOGRAPHING PLANS, SECTIONS, AND DRAWINGS.

TRANSFER a tracing of the drawing to be zincographed on to a zinc plate properly prepared for drawing on—the transfer is to be made in a manner precisely similar to that employed for lithographing. Having transferred the tracing, take off the latter, and with a perfectly clean silk handkerchief remove the superfluous red chalk which will appear on the plate—draw in the lines and other parts in precisely the same manner as on stone. In drawing on zinc be careful not to breathe on it, and keep it at all times in a dry place; the least damp has a tendency to corrode the metal, when the drawing would be spoiled. Great care is requisite to keep the surface of the plate free from dirt, even the fingers must not be allowed to touch it, or those places where they are allowed to rest will be rendered quite unfit for use. It is a very good way to keep

Zinc plate must not be breathed on.

How to remove ink or grease spots.

Advantages of zinc over stone.

Zinc may be drawn on with greater facility than stone.

Drawing pen proper for zinc.

so much of the plate as is not actually being worked on covered up. If spots of ink or grease should accidentally find their way on to the plate, they may be removed by rubbing such places with a little clean turpentine and a piece of blotting-paper. Zincography has much to recommend it in preference to lithography, as regards its use for plans and sections. It is not an invention of as long standing as lithography, and although the use and treatment of the zinc plate in the hands of the draughtsman is perfectly as simple as that of stone, yet with the printer the case is different. Printers in general have not had as much experience of zinc printing as they have had of stone printing, consequently there are fewer available zinc printers; this will not long be the case, for experience teaches us that zinc is the preferable material for railway plans and sections, and for all works of magnitude requiring speed in the execution. Its extreme portability and cheapness are its principal recommendations. It is much easier drawn on than stone. It is a difficult matter to use the drawing pen without a ruler on stone, the surface being polished there is a liability to slip; but the zinc being grained, the grain very much resembling drawing paper, the drawing pen lays hold of it, and crooked or straight lines may be drawn with as great facility as on drawing paper. Drawing on zinc is very destructive to the drawing pen. It will be necessary to set the pen about three or four times a day to insure always drawing fine lines. The best drawing pen to use for drawing on zinc is *Hawkin's Everlasting Pen*, described at page 54, and of which a drawing is given, fig. 22, plate "MATHEMATICAL DRAWING INSTRUMENTS."

OF ENGRAVING PLANS, SECTIONS, AND DRAWINGS.

IN the aggregate, engraving is very superior to lithographing where long numbers are required*. This is an art requiring much more training in the manipulation than lithographing. It comes more exclusively within the sphere of the workman, and for that reason it would not perhaps be advisable for the engineer's or surveyor's draughtsman to attempt it. This art may, however, be superintended by the last-named class ; that is to say, it may be done in the engineer's or surveyor's office. Of late days a very ingenious contrivance has been resorted to, viz., the transferring from engraved plates to stones and plates of zinc prepared in the ordinary way for drawing ; by this means drawings are multiplied without damaging the engraved plate, from which, should it be required, hundreds of transfers may be taken†.

Of the comparative prices of engraving and lithographing it is difficult to form an estimate ; the prices of both having risen considerably with the increased demand. In ordinary times the price of lithographing does not exceed about one fourth of the price of engraving, but in the present day it would appear that the practitioners of each art endeavour to rival the other in regard to high charges ; in fact, it may be fairly stated that (for the most part) every one tries to get the most he can. As it is impossible that this state of things can last long, we may expect to see prices considerably altered, and settle down to their former level.

Of printing engraved plates in the lithographic press.

Comparative prices of engraving and lithographing.

* By *long numbers* is meant, where many impressions are required, as 10,000 or upwards ; it is sometimes impossible to lithograph, *in toto*, a very large number of plates ; it is customary to resort to *engraving*, when a sufficient number of lithographic draughtsmen cannot be procured. When this method is resorted to, in an office where there are not presses adapted for printing from engraved plates, impressions may be taken from the engraved plates—by a copper-plate printer—on India paper, and these impressions may be transferred to stones or zinc plates properly grained for the purpose.

† The transfers made on to stones or zinc plates are printed from, and the original engraved plates are preserved in as good condition as when first engraved.

OF THE COMPARATIVE MERITS OF LITHOGRAPHING AND ENGRAVING.

ENGRAVINGS made on plates of copper or zinc have very much to recommend them in preference to lithographic drawings. Setting aside the question of expense, the engraving is much to be preferred; 1st, for the firmness or soundness which is usually found to prevail in the work generally; and, 2ndly, from its durability.

Firmness and durability of engraved work.

Engraved plates are not liable to be spoiled or rubbed out in use, whereas lithographic or zincographic drawings are very susceptible of injury and are not very easily repaired, nor is the process attended with any certainty. This position may be contradicted —nay, some lithographers may laugh at the assertion, and attribute it to the inexperience or ignorance of the writer on the subject; however, I have had quite sufficient experience to justify my stating, in general terms, that alterations in lithographic drawings are attended with very great inconvenience, delay, and uncertainty; whereas alterations on copper or zinc engraved plates are effected with the greatest ease, by simply *hammering up*, as it is termed, the portion requiring the alteration; a new surface is by this means produced, and it only becomes necessary to remove the portion requiring alterations, and to re-engrave that portion; but in a lithographic or zincographic drawing it is impossible to alter or mend the least portion without removing a considerable quantity of the adjoining work—this work must of course be restored; in this operation much mischief is apt to be done by not going exactly over the old lines*; frequently the work *will not stand*, as it is termed, when it must be again redrawn, and it is by no means unusual to have an entire drawing lost in the attempt to effect a trifling alteration. Having taken the worst view of the case, the proper method of effecting such alterations shall now be stated at length:—First carefully wash the gum off the stone, or that portion requiring the alteration, and also off a small portion surrounding the same; with a broad-bladed knife remove the surface from that portion where the alteration is to be made, and likewise from a small space round it. Trace down the work to be drawn in and replace the part removed in the ordinary manner, or in the same way in which it was drawn in the first instance. You may now give it into the hands of the printer, who will do the rest, or you may cover the part so mended with gum water, to be laid on with a large flat camel's-hair brush. It has been stated that the first operation is to wash off the gum; some draughtsmen take the gum off the

Alterations.

Uncertainty of alterations standing.

Showing by what means alterations may be successfully effected.

* Should the old lines be not gone over *exactly*, there will be a probability of two sets of lines printing, which will of course render the impressions useless.

entire stone, some take it only off that part requiring the alteration—in point of fact it matters not which practice be adopted. With regard to *erasing* the space to be altered, it is necessary to produce a new surface in order to make the ink adhere to the stone, and it is further desirable to erase a little more than the exact space to be altered, for this reason, viz., if only the exact space requiring the alteration were erased, there would be a tendency to make too great a hollow in that particular spot; but by preparing a space somewhat larger this difficulty is not so likely to occur. Were the erasure effected too deep, the *scraper* used in printing would pass over that particular portion without pressing on it, and consequently the altered portion would not appear on the impression, or as it is technically denominated, *would not print up*. When the surface to be re-prepared for drawing on is considerable, it is usual to *snake it out*—that is, to rub it over with a piece of *snake stone* and some clean water. The erasing knife mentioned above, may be procured at any of the artists' colour shops.

ALTERATIONS ON ZINC are effected in the following manner, viz., wash the gum off the entire plate, and rub out the portion to be altered with turpentine, held either in a short stumpy brush, or taken up at the end of a small piece of blotting paper folded up in the shape of a piece of paper used for lighting a candle. When the old work is quite removed, take up the ink and turpentine remaining on that portion of the plate with a clean piece of blotting paper; repeat the rubbing with fresh turpentine, and having meantime cleaned the brush, absorb the turpentine as before—so far you will have removed the old work. Now apply to the place so *cleaned out* a mixture of sulphuric acid and water, in the proportion of one part of the former to six parts of the latter, or thereabouts; you may allow this to remain on for about a minute, when it must be absorbed with clean blotting paper, and the prepared space washed over with a clean sponge and water; some persons repeat the application of the acid, and again wash the place. Practice and experience alone will enable you to form your own judgment on these matters. The draughtsman who is anxious to become a lithographic or zincographic draughtsman, is recommended to take some instruction from a practical lithographer, where he will have an opportunity of seeing the application of the instructions given above, and where many minor points may be inquired into and ascertained.

How to effect
alterations on
zinc plates.

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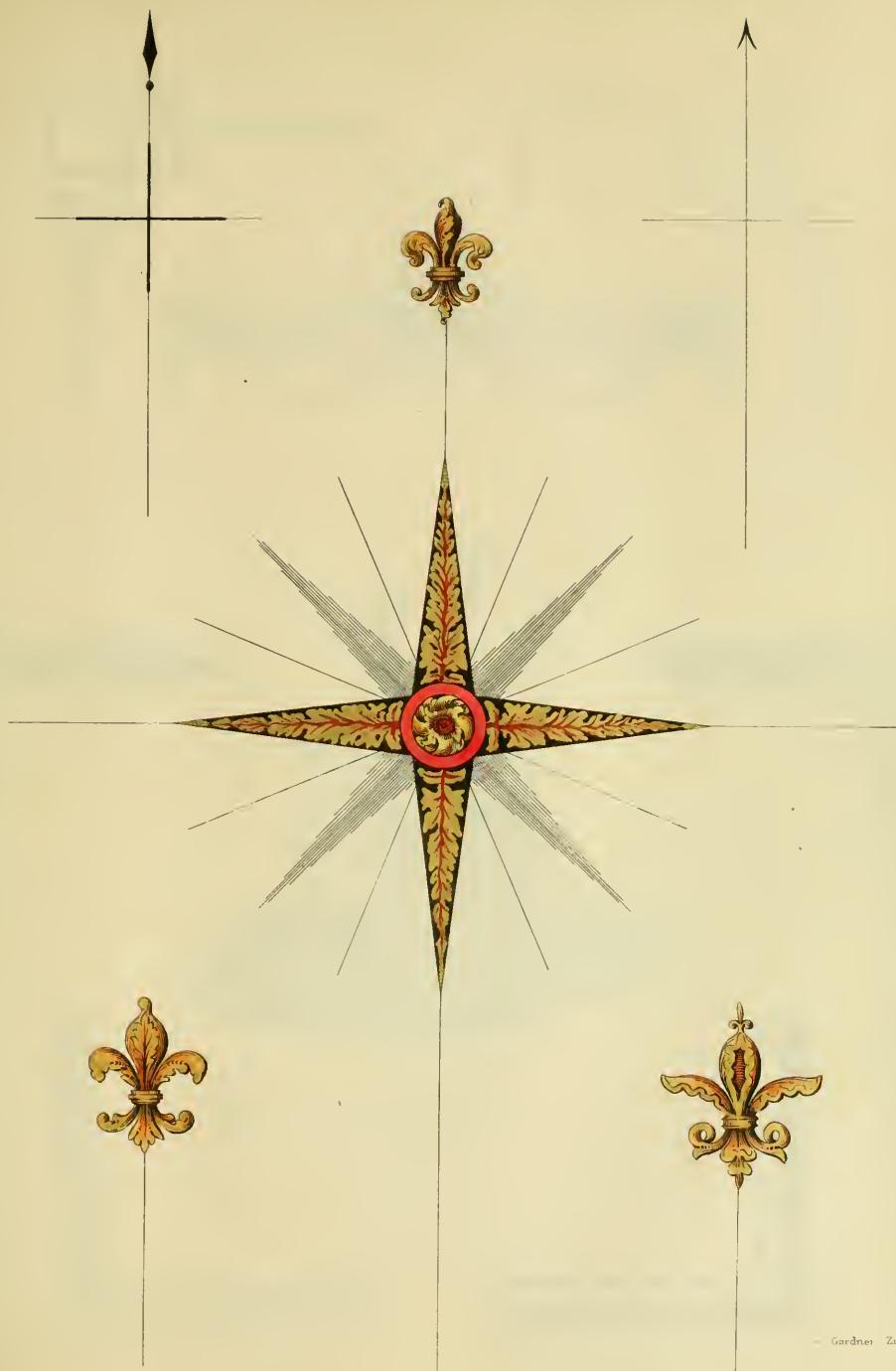
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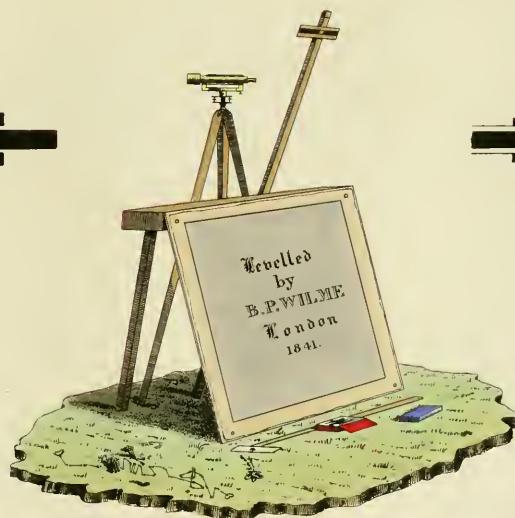
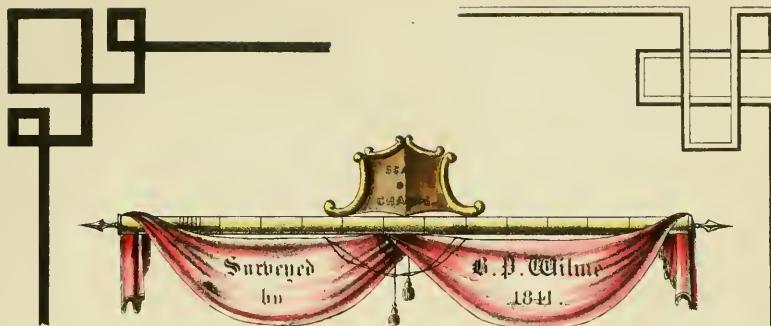
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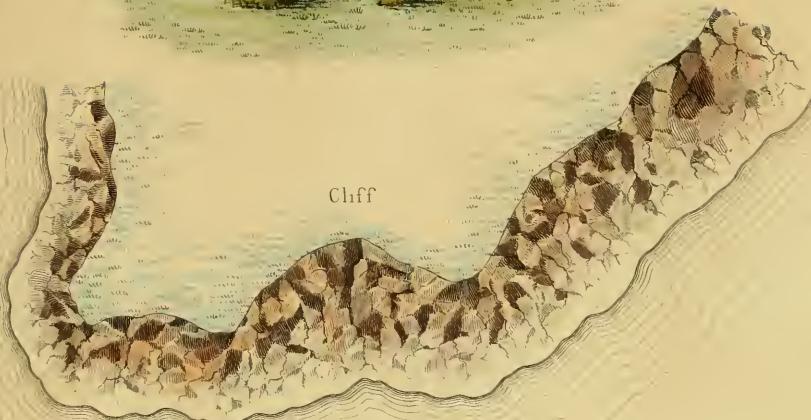




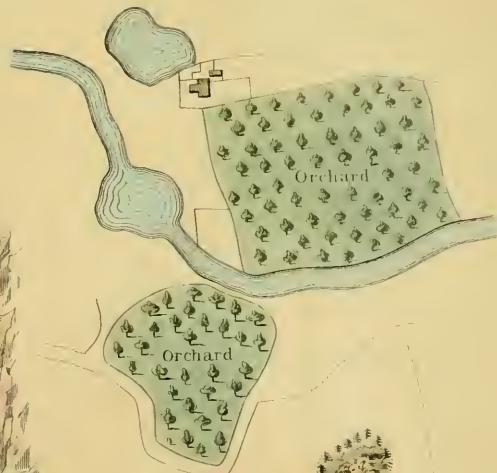
Woodland



Cliff



Rock



SECTION PLAN SECTION

OF AN

ESTATE

PLAN

OF A

MAP

RAILWAY

IN THE COUNTY OF

KENT

SURVEYED

1841

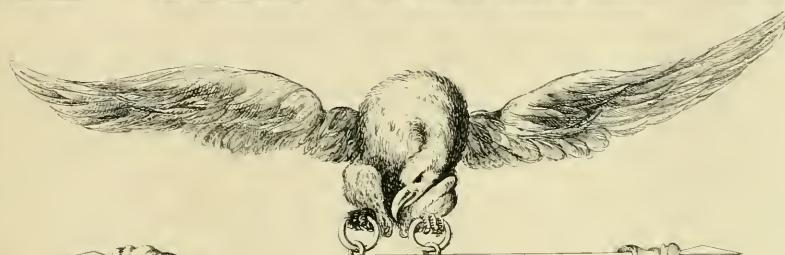
PLAN

PLAN

PLAN

OF THE PARISH OF

OF THE PARISH OF



OF THE PARISH OF

Showing the Proposed Extension of the Road

Through that Part of the

SCALE

6 CHAINS TO AN INCH,

REDUCED COPY FROM SEALED MAP

on

3 CHAINS TO AN INCH.

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CHAINS TO AN INCH.

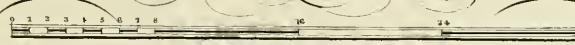
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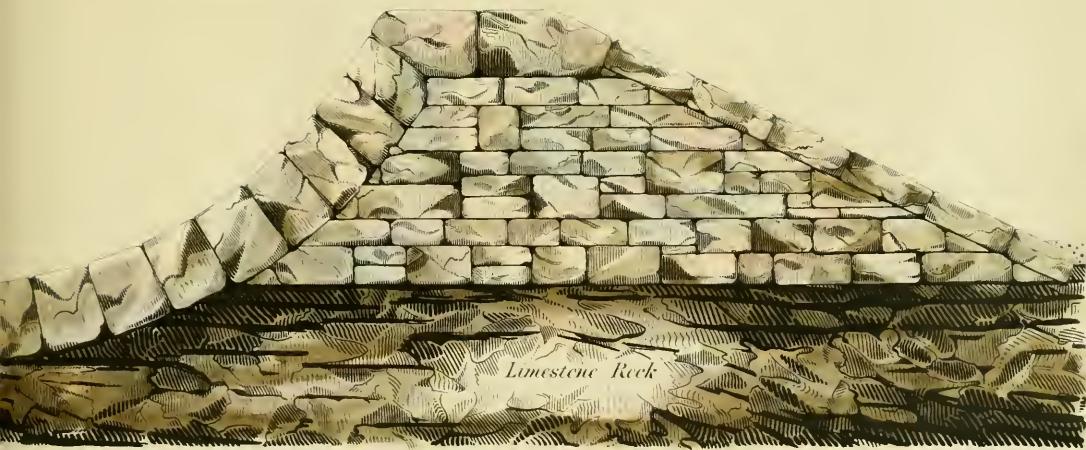
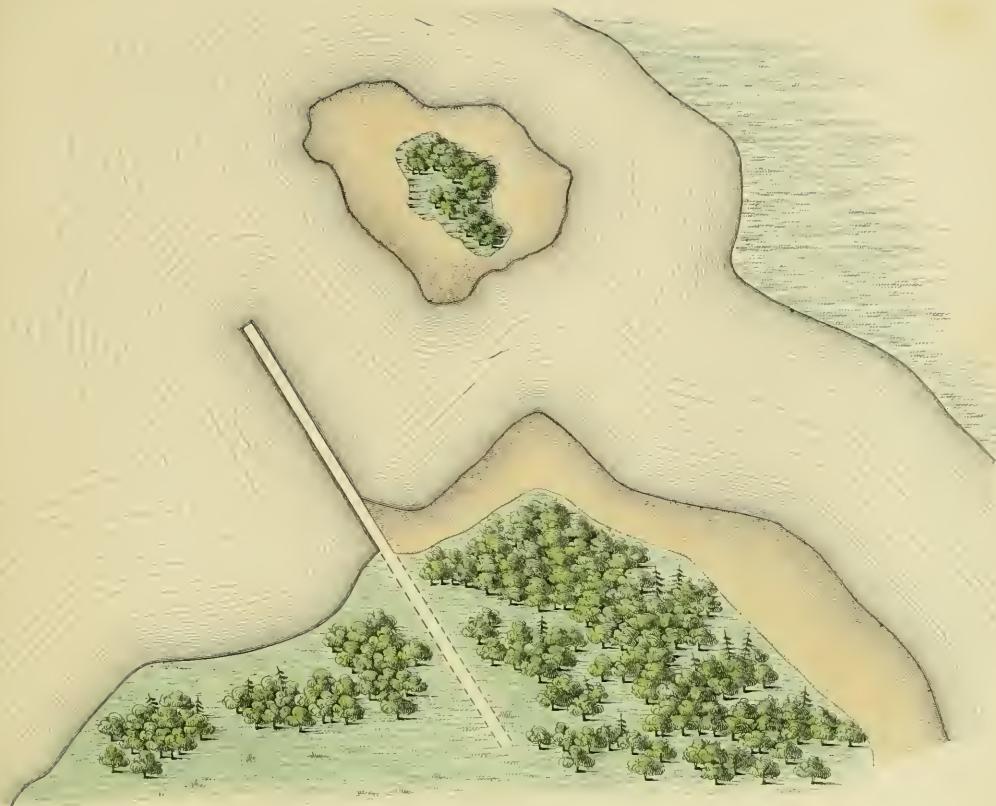
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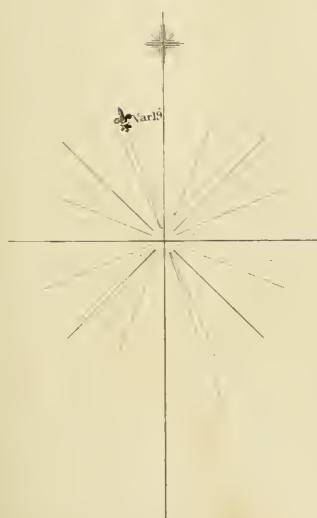
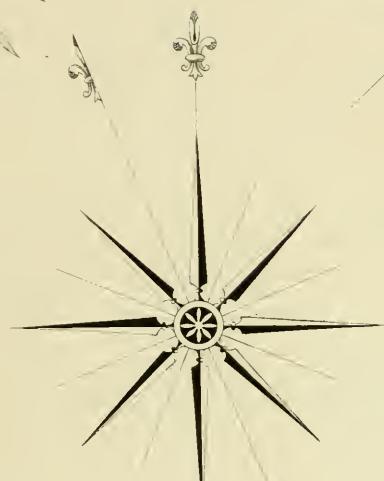
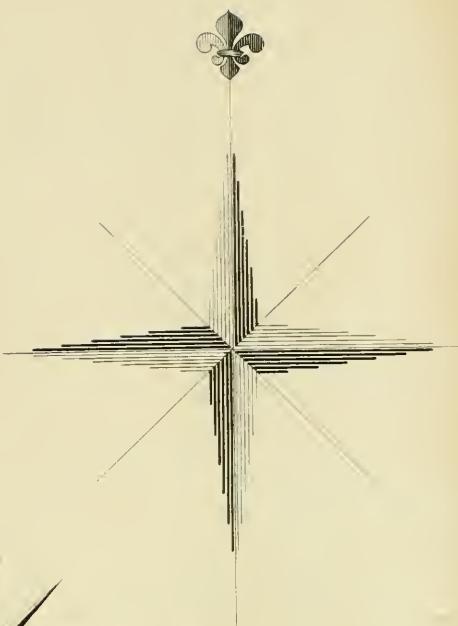
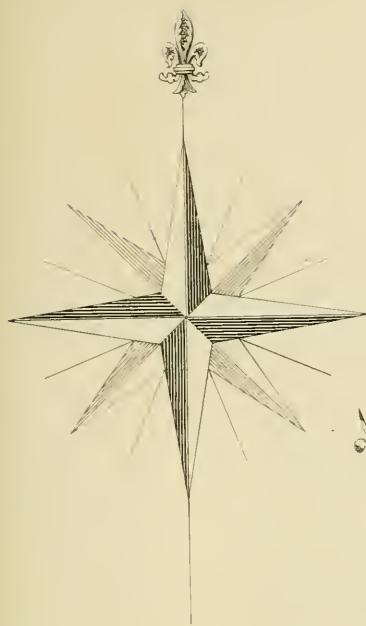
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8 FEET TO AN INCH.







Plan of
THE PARISH OF
SHOTTISHAM,
IN THE COUNTY OF
SOMERSET.

Standage & C° Litho 77. Cornhill London

1841.

H I L L S N° 1. (PICTURESQUE)



FOREST TREES IN ELEVATION,

N^o I.



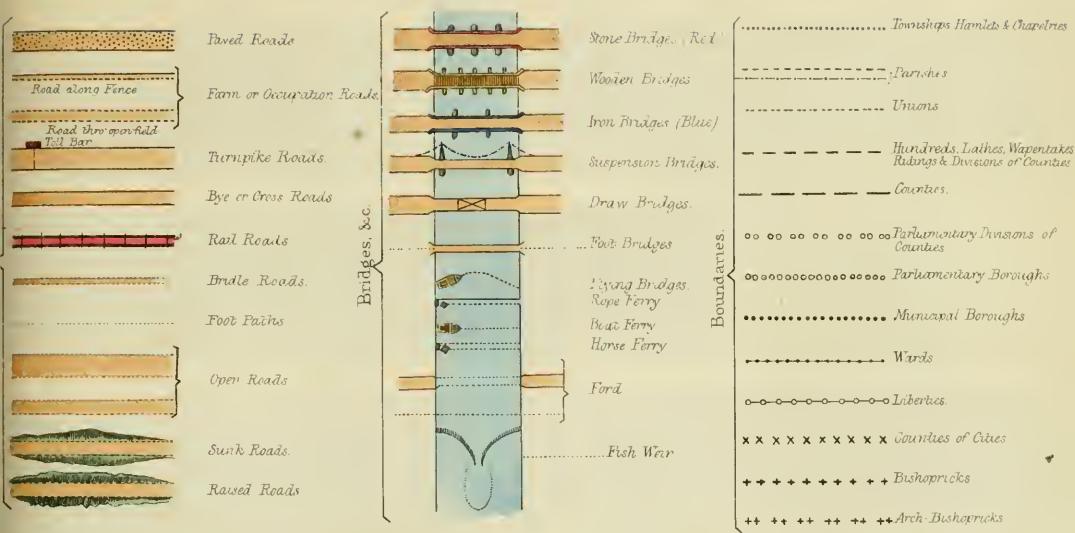
Arranged & Drawn to Scale for Maps & Plans by B P Wilme. London B32.

The smallest Tree throughout the Diagram is recommended for Plans at a scale of Three Chains to one Inch.

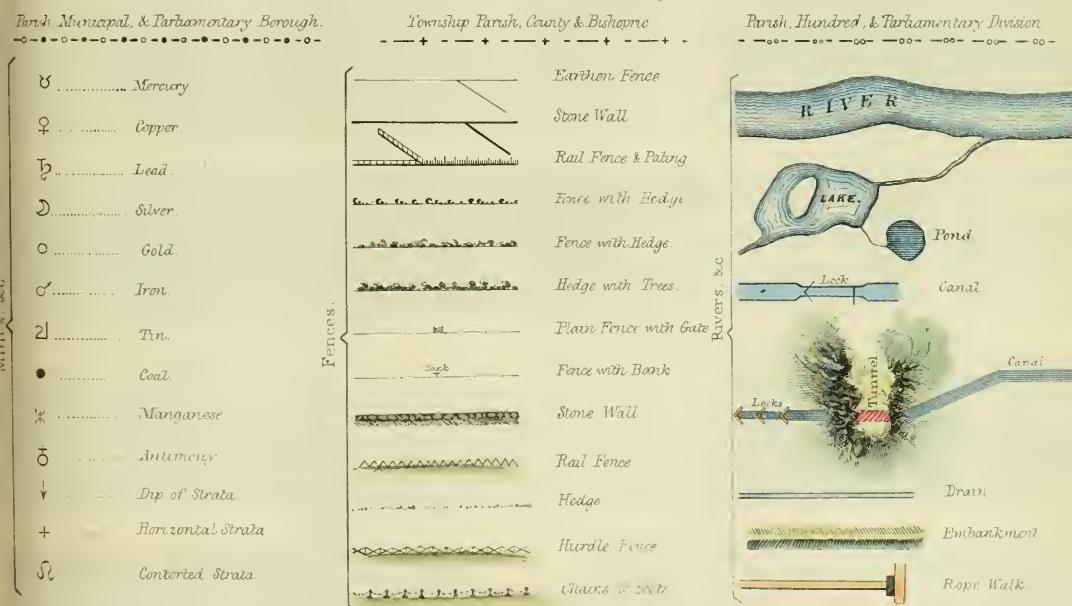
From nature especially for the Work by C. Du Noyer

SIGNS USED IN MAPPING.

NO. 1.

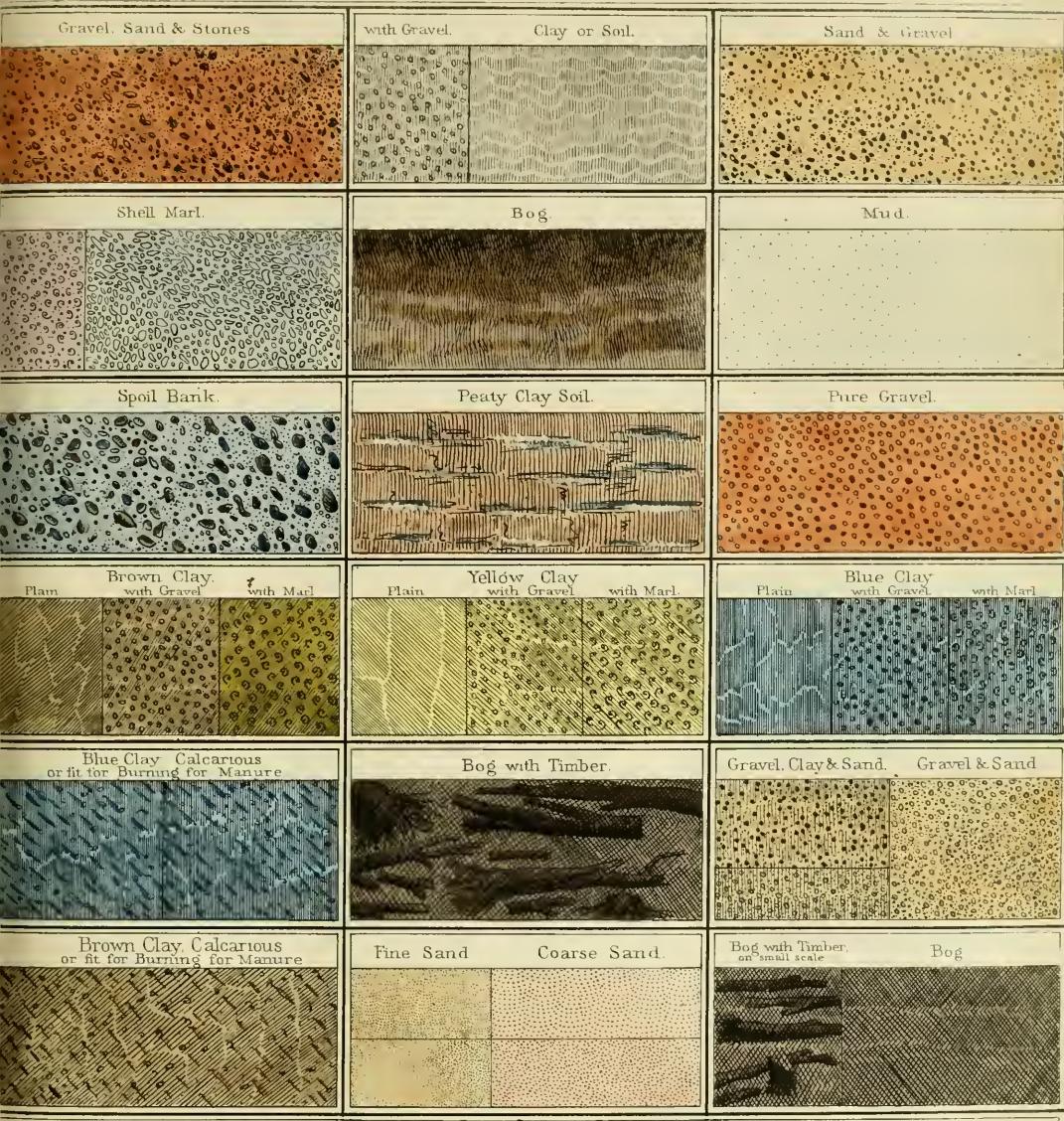


Combination of the Boundary Signs.



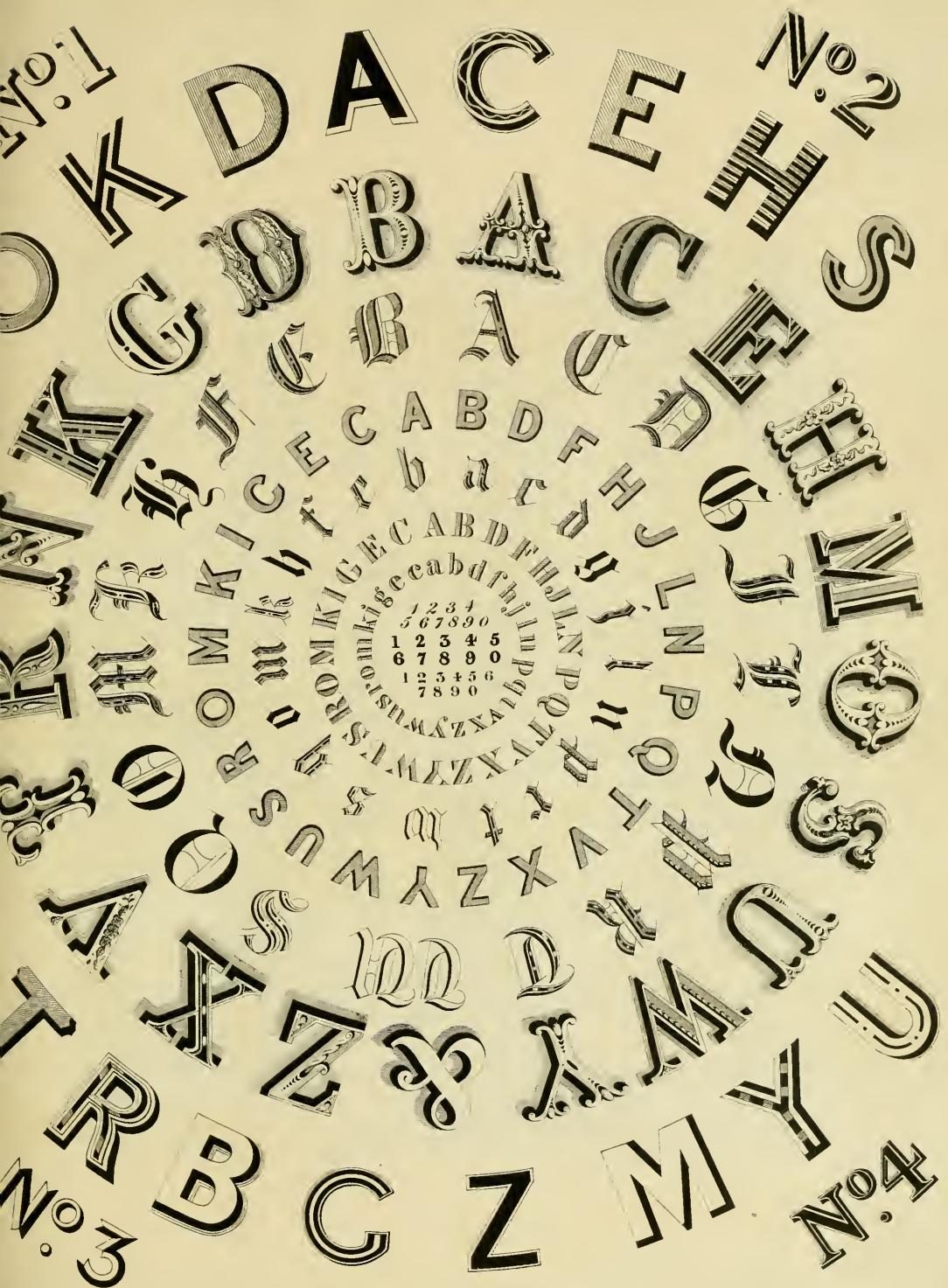
The Diagrams drawn in the first part of this work are based on Pictures drawn at a Scale of 3 Miles to 1 Inch.

METHOD of Shewing STRATA in SECTION,
as applicable to Engineering Drawing.

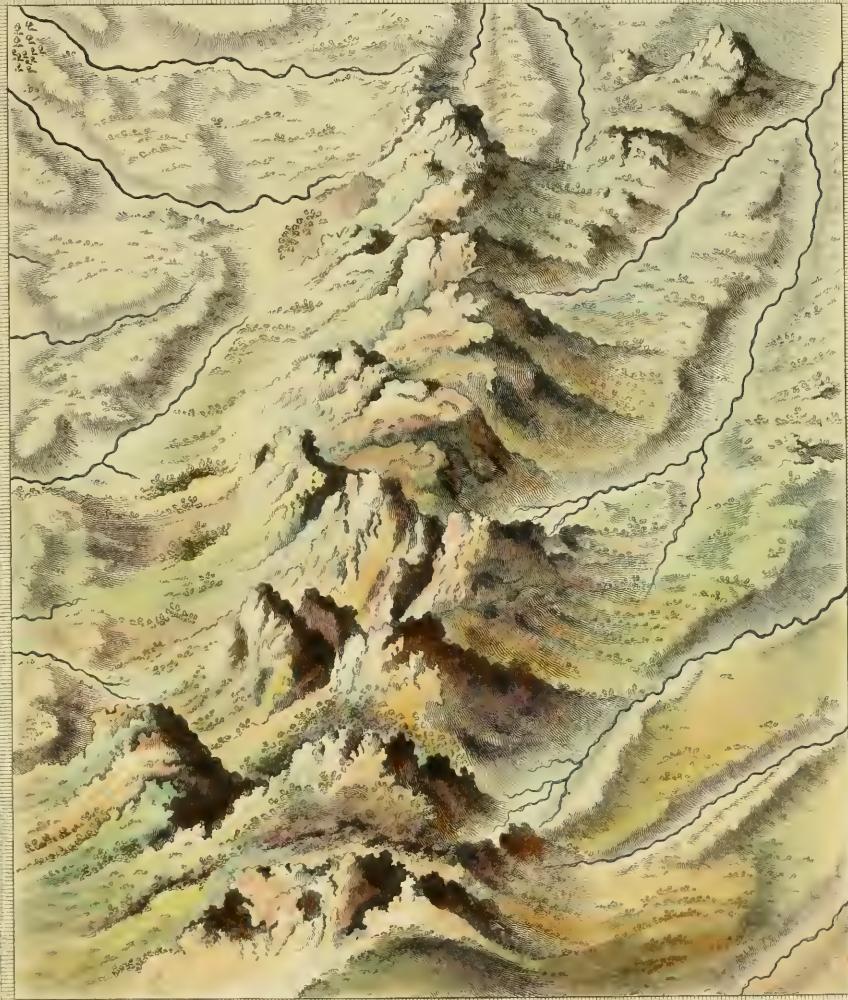


Combination of the above Diagrams.

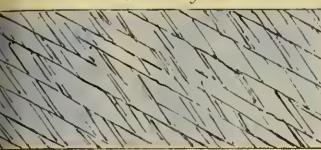
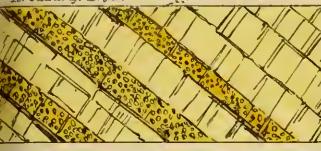
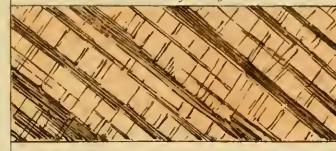
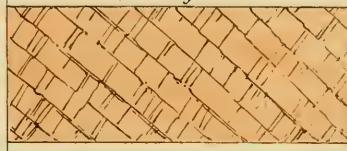
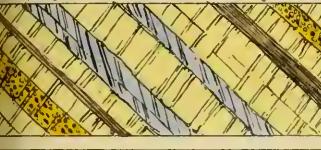
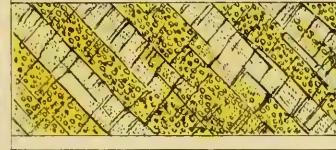
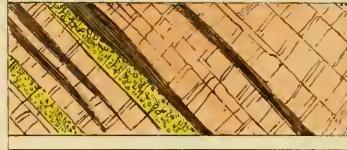
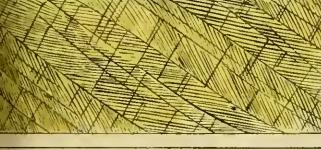
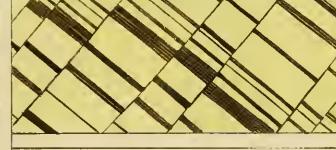
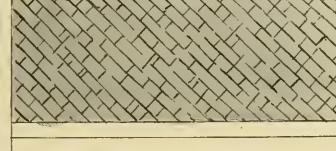
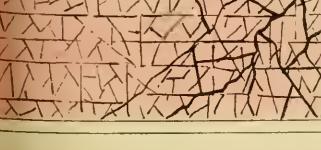
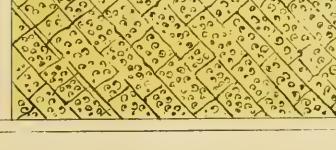
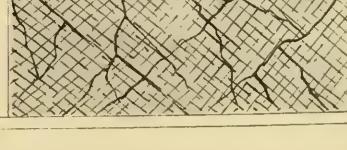




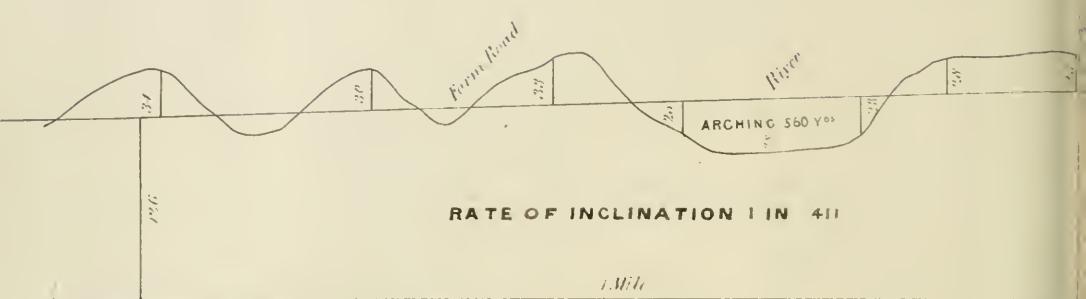
The METHOD of DELINEATING MOUNTAINS



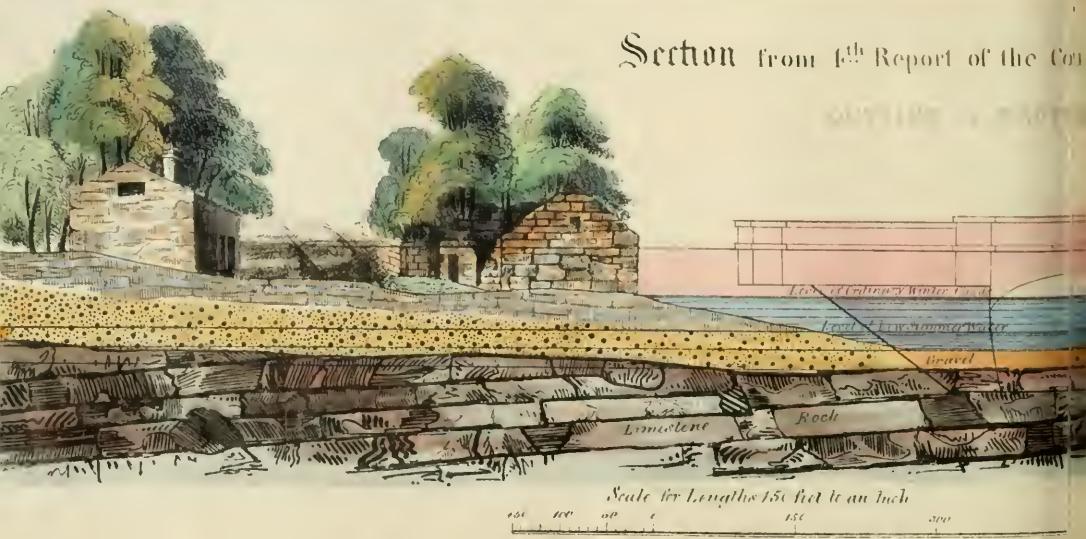
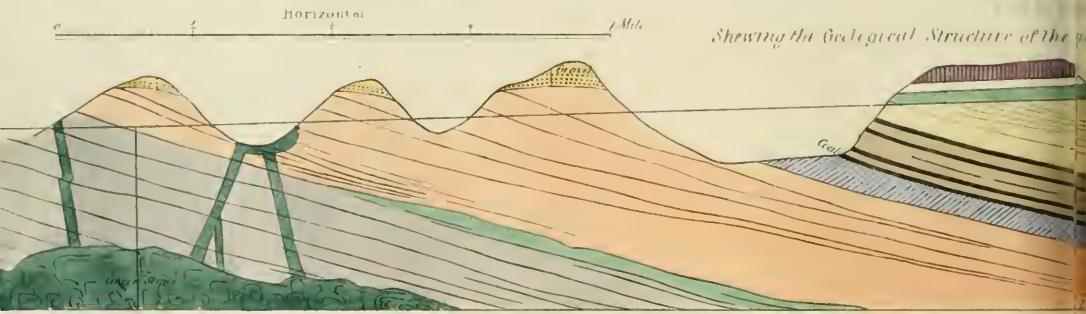
STRATA AS APPLICABLE TO ENGINEERING.
STRATIFIED ROCKS

<i>Compact Limestone for Building</i>	<i>Slaty Limestone beds of Shale</i>	<i>Compact Limestone for Burning</i>
		
<i>Compact Sandstone for building. Layers of Conglomerate</i>	<i>Red Sandstone with soft Clay Layers</i>	<i>Compact Red Sandstone for Building</i>
		
<i>Sandstone with layers of Limestone, shale and Conglomerate</i>	<i>Conglomerate Coarse & Fine</i>	<i>Red Sandstone Layers of Conglomerate & Shale</i>
		
<i>Irregularly Laminated Sandstone for Flaking</i>	<i>Sandstone with Layers of Coal</i>	<i>Light Colored Building Limestone</i>
		
<i>Sandstone containing veins of Gypsum on Sulphate of Lime</i>	<i>Limestone Containing Mineral Veins</i>	<i>Limestone containing Fossils for Burning & Building</i>
		
<i>Clay Slate for roofing</i>	<i>Clay Slate for Flaking</i>	<i>Clay Slate for Building</i>
		
<i>Gravile containing Mineral veins</i>	<i>Shelly Millstone</i>	<i>Clay Slate Containing Mineral Veins</i>
		

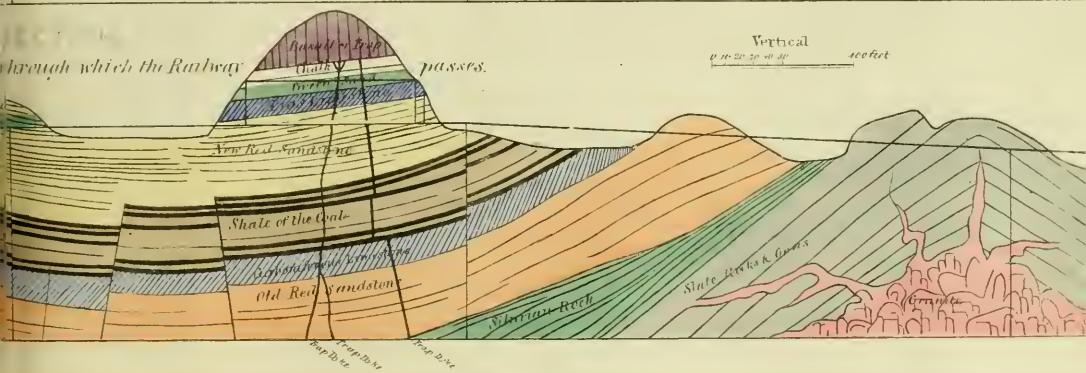
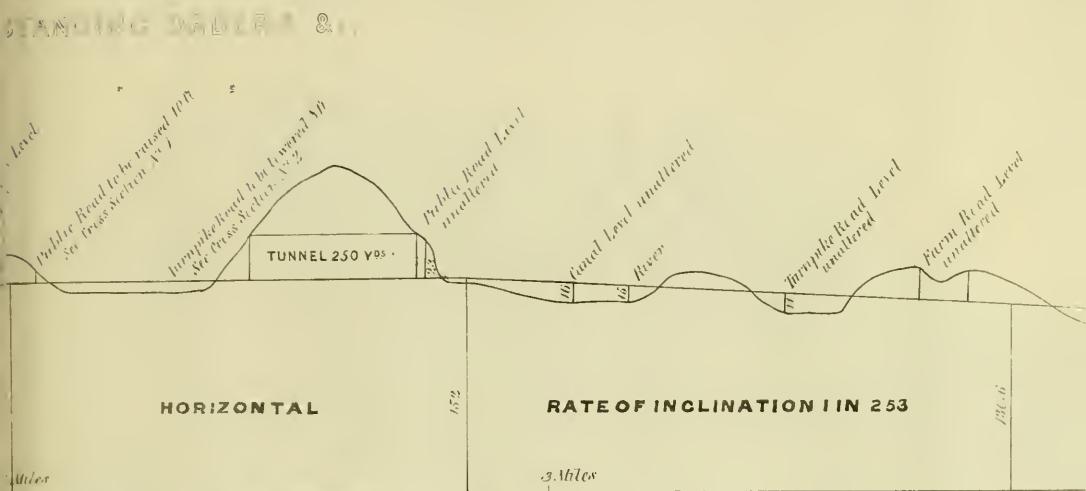
Application of the Diagrams of STRA



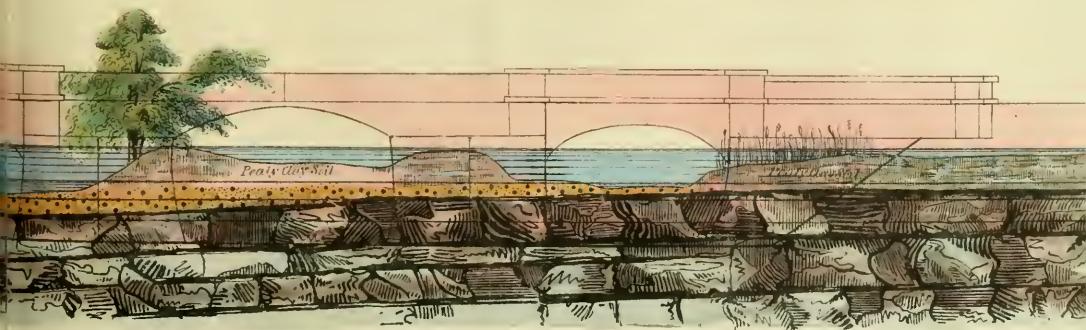
Datum Line 65 feet below Top Water of Canal

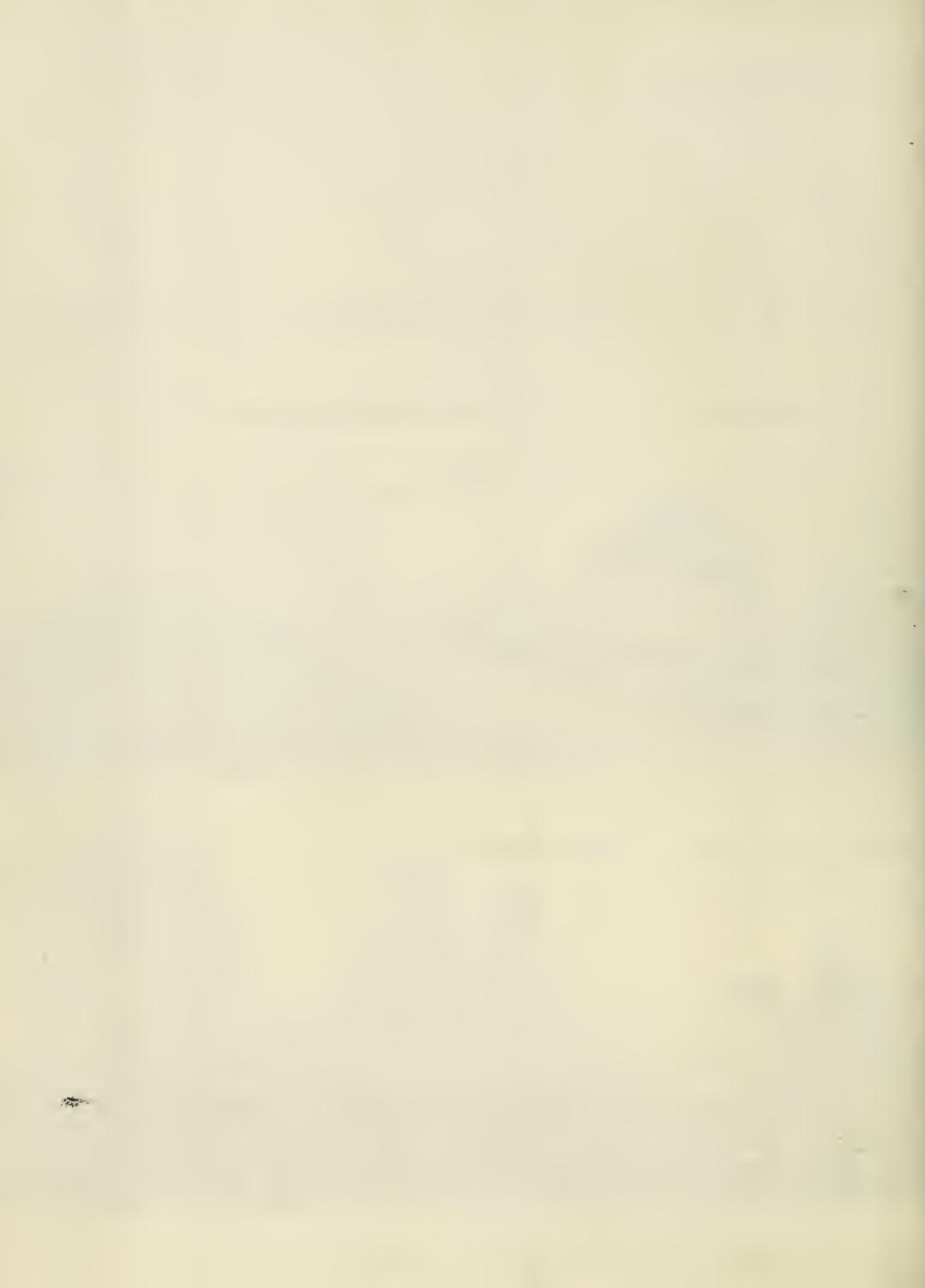


THE PROJECTION OF ENGINEERING SECTIONS.



CHARTERS FOR THE IMPROVEMENT OF THE RIVER SHAMON,





HILLS, N° 2.

METHOD OF REPRESENTING HILLS AND VALLIES BY NORMAL CONTOURS.
Or by a series of Lines, traced on the Ground at equal Vertical distances & Parallel to the Horizon.

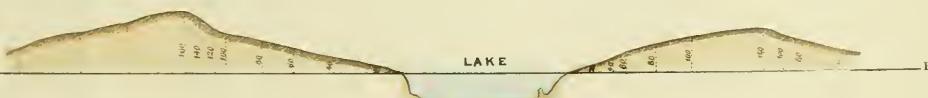
A



B



A



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Gothic Letters and Numerals.

A B C D E F G H I K L M N

O P Q R S T U V W X Y Z

a b b e c d e e f f g o h b i k k l l m m n

o o p p q g r r s s f t n u v v w x x y z

I + II + III + IV + V + VI + VII + VIII

IX + X

Church Script

a b r d e F g h i j k l m o
o p q r f s t u v w f y g §

MAP ENGRAVING.

SPECIMEN for DELINEATING COUNTY MAPS.



Received by R.R. Wilson, 6/6

Enclosed by *Leviathan* 33 Brixton Street, London, S.W.1

Engraved for Wilson's Hand Book for Planning & Engineering Drawing.

The METHOD of DELINEATING a HIGH MOORISH COUNTRY.



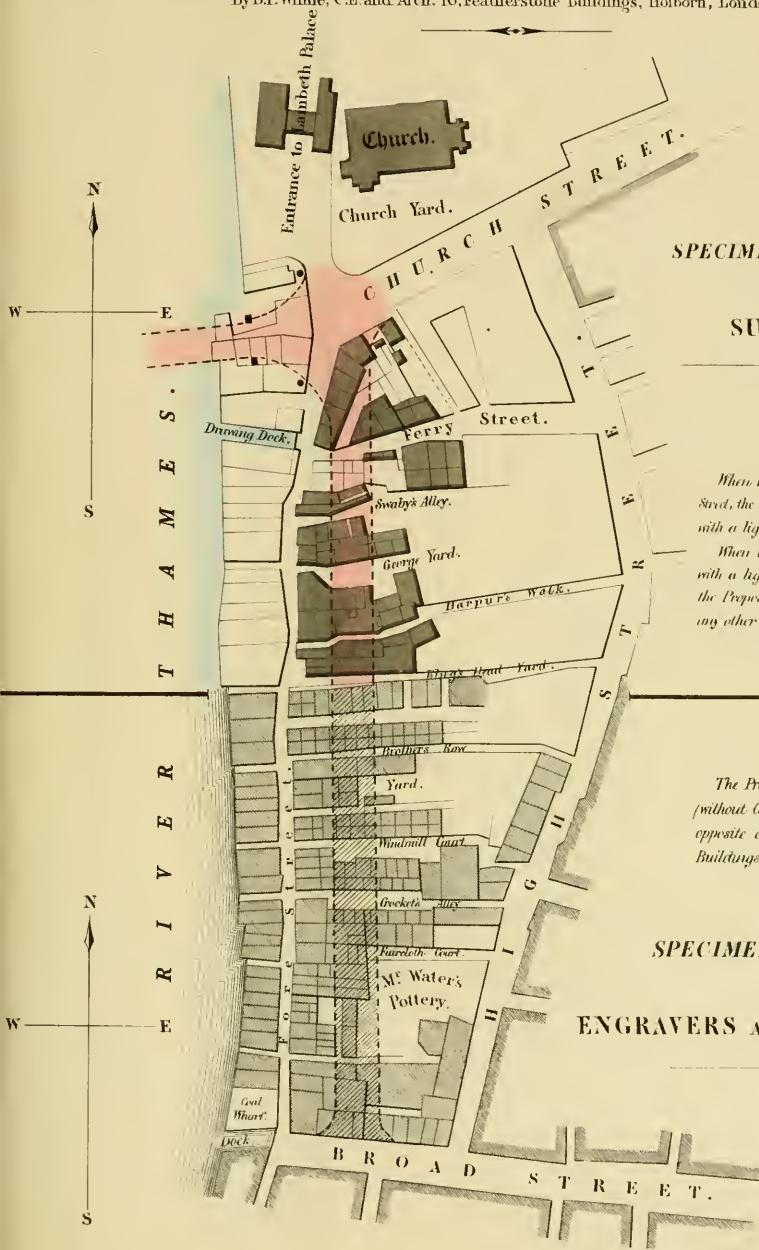
Scale of One Inch to a Mile

Engraved by J. Gardner, 33, Brewer Street, Golden Square

STREET IMPROVEMENT PLAN

PLAN of PART of the PROPOSED STREET from CHURCH STREET to VAUXHALL, showing the Property required for the Improvement, between CHURCH STREET and BROAD STREET.

By B.P. Wilhue, C.E. and Arch^t. 16, Featherstone Buildings, Holborn, London.



SPECIMEN OF DRAWING

for

SURVEYORS.

NOTE.

When Pink is used to show the Proposed Street, the Houses should be coloured in Black, or with a light wash of Indian Ink, or Hatched.

When the Houses are coloured in Black, or with a light wash of Indian Ink, or Hatched, the Proposed Street may be coloured Yellow, or any other bright tint.

NOTE.

The Proposed Street may also be shown (without Colour) by Hatching drawn in an opposite direction to the Hatching on the Buildings: as in example.

SPECIMEN OF DRAWING

for

ENGRAVERS AND LITHOGRAPHERS.

Scale of Feet.

100 200 300 400 500 600 700

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INSERT FOLDOUT HERE

INSERT FOLDOUT HERE

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WRITING AND PRINTING.

THE TRUE METHOD of forming TITLES for MAPS and other PIECES OF WRITING,

On writing principles; showing the necessary construction Lines. —

Original Title.

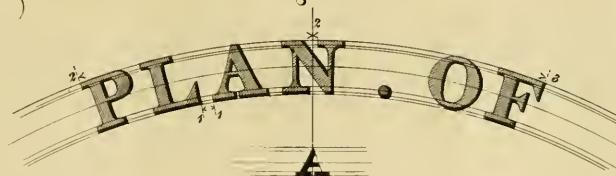
Plan
Proposed Extension of the
Dublin & Kingstown Railway
from
Kingstown to Dalkey.

Model or Trial Title. —

Fig 1.

1st Line = 7 Letters.
2nd Line = 1
3rd Line = 18 P.....D.E.....N
4th Line = 6 OF. THE
5th Line = 28 D....N.A.D.K.....N.R.....Y
6th Line = 4 FROM
7th Line = 19 K.....N.T.O.D....
*
A

Fig. 2.



PROPOSED. EXTENSION

OF. THE

DUBLIN. AND. KINGSTOWN. RAILWAY

KINGSTOWN. TO. DALKEY

Lines drawn thus —
at the construction Lines; these
should be drawn in Pencil and rubbed
out when the Title is written.

The Letter I occupying $\frac{2}{3}$ ^{ds} less space and the Letters M. & W. $\frac{1}{3}$ ^{ds} more than any other Letter, will necessarily throw the
middle Letter of a Line in most cases out of the centre; as the following.

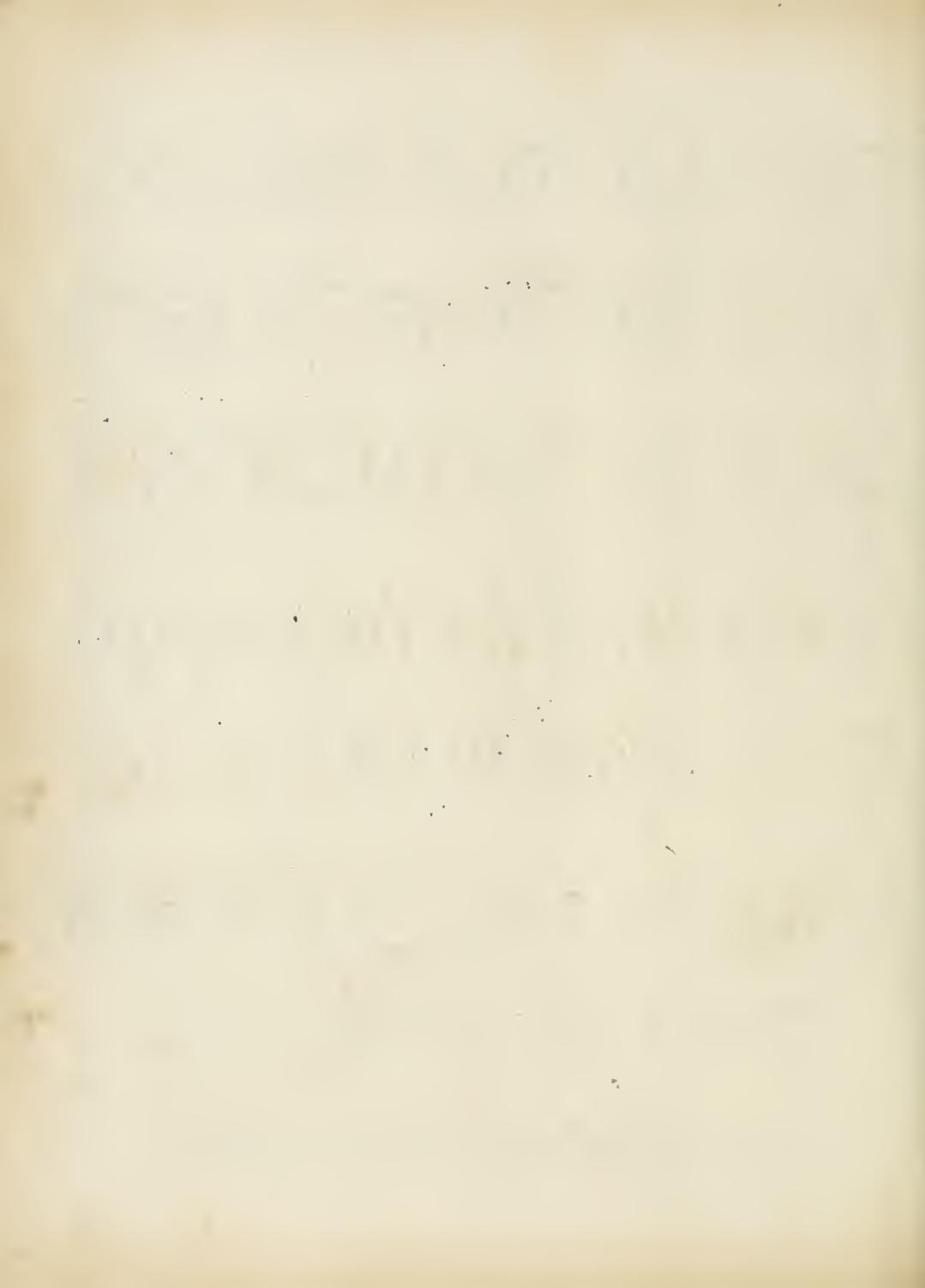
KINGSTOWN

A B C D E F G H I J K L M N O P Q R
S T U V W X Y Z

a b c d e f g h i j k l m n o p q r
s t u v w x y z

A B C D E F G H I J K L M N O P Q R
S T U V W X Y Z.

a b c d e f g h i j k l m n o p q r s t u v w x y z



A B C D E F G H I K

L M N O P Q R S T

U V W X Y Z &c.

a b c d e f g h i j k l m n o p q r s t

u v w x y z

A B C D E F G H I K L M N O P Q R

S T U V W X Y Z &.

a b c d e f g h i j k l m n o p q r s t u v w x y z.

STAINFOIL OR (STENCIL) PLATES.

Shewing the Method of using them.

Fig 5

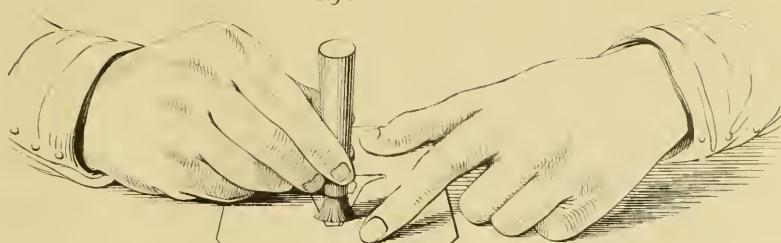


Fig 4

Scale of Chains

Stencil Plate Brush

Fig 3.

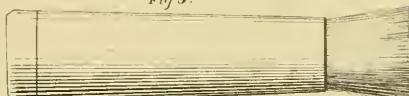


Fig 1.

Stencil Plate

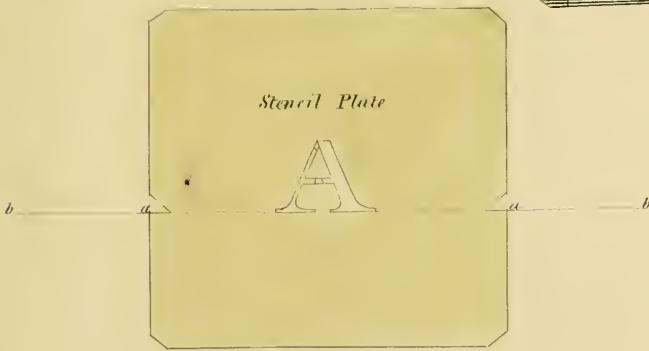


Fig.2.

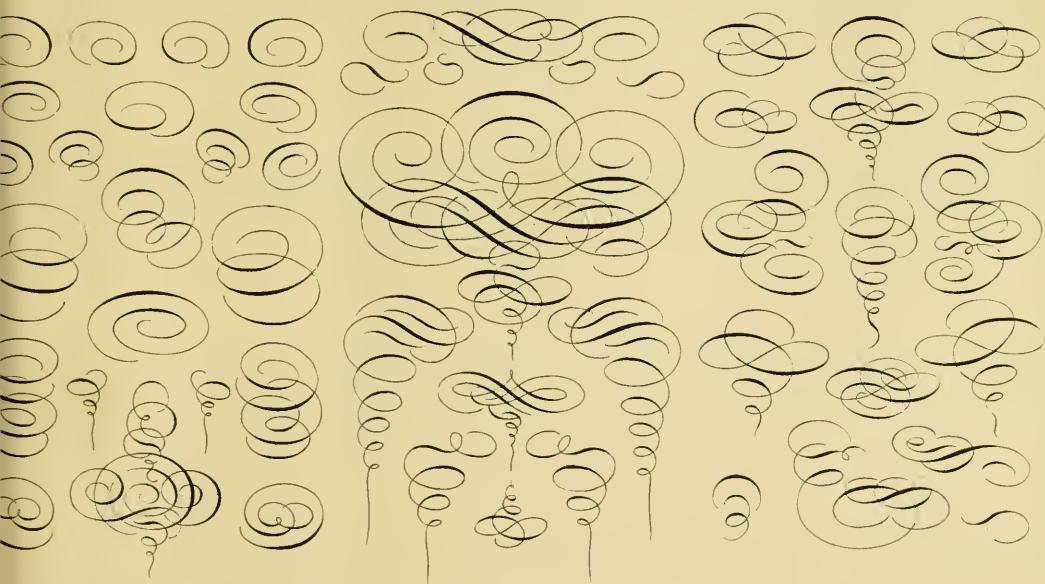
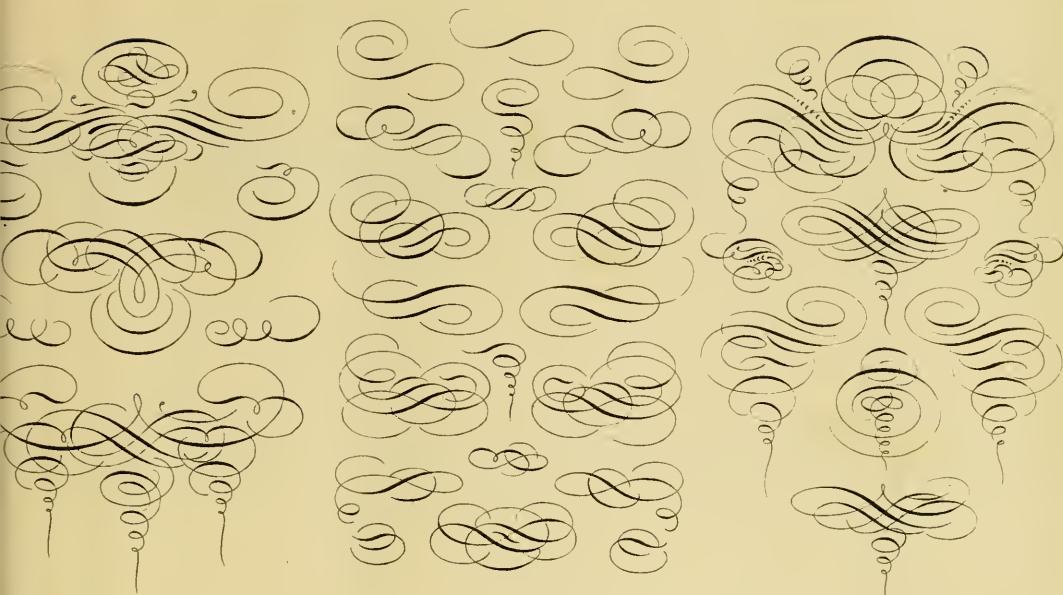
Impression from



Stencil Plate

b.b. Pencil line, on which the words to be printed are to be placed
a a Setting line which being drawn through the Base of each letter, enables us to place it in its
proper position on the Pencil line b.b.

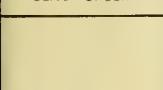
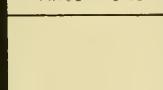
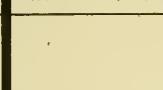
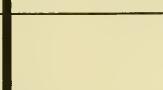
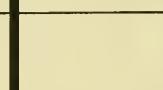
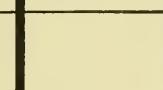
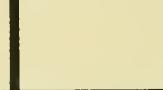
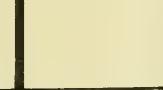
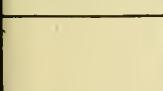
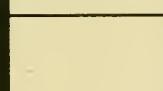
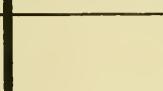
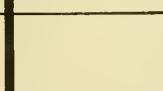
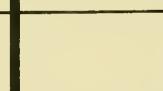
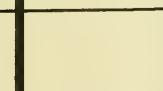
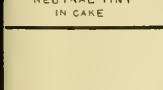
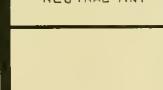
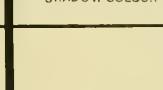
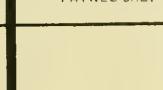
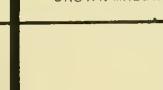
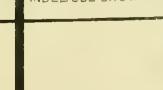
DESIGNS FOR FLOURISHING.



COLOURS. N°1.

COLOURS USED BY ARCHITECTS, SURVEYORS, AND CIVIL & MECHANICAL ENGINEERS.

SHOWING HOW TO PRODUCE THE REQUIRED TINTS BY ADMIXTURE

PRUSSIAN BLUE	INDIGO	ANTWERP BLUE	COBALT	NAPLES YELLOW	CAMBOCHE
					
SLIGHTLY BORDERING ON GREEN	NOT BRIGHT BUT VERY CLEAR	A GREEN TINT	AZURE TINT	SOMETIMES USED IN ARCHITECTURAL DRAWINGS	HIGHLY USEFUL TRANSPARENT YELLOW
CARMINE	CRIMSON LAKE	INDIAN RED	LIGHT RED	YELLOW OCHRE	RAW SIENNA
A VERY BRILLIANT DEEP TONED CRIMSON	LESS BRILLIANT THAN CARMINE, GENERALLY USEFUL	WHEN MIXED WITH INDIAN INK MAKES GOOD SHADOWS	SLIGHT ORANGE TINT	MAKES FINE GREENS WHEN MIXED WITH ANTWERP BLUE OR INDIGO	GIVES BRIGHT SUNNY TINTS AND MIXED WITH ANTWERP BLUE OR PRUSSIAN BLUE GIVES VERY CLEAR GREENS
OLIVE GREEN	PRUSSIAN GREEN	PRUSS. BLUE & CAMBOCHE	PRUSS. BLUE & R. SIENNA	CHROME YELLOW N°1	CHROME YELLOW N°2
					
MUCH USED IN LANDSCAPE	RAW COLO. GREEN	WHEN MIXED PRODUCE A GREEN VERY SIMILAR TO PRUSS. GREEN	FORM CLEAR GREEN	USEFUL IN GEOLOGY	USEFUL IN CLIMATE
SEPIA	BURNT SIENNA	VANDYKE BROWN	COLOGNE EARTH	BURN TUMBER	CHROME YELLOW N°3
					
MIXED WITH CAMBOCHE IT FORMS FINE NEUTRAL GREENS	MIXED WITH ANTWERP BLUE (OR COBALT) IT FORMS FINE NEUTRAL GREENS, BUT WHEN IT GIVES FINE OLIVE GREENS.	MIXED WITH INDIGO IT GIVES VERY CLEAR NEUTRAL GREENS.	A COOL BROWN, USEFUL FOR THE SHADOWS OF BUILDINGS	AFFORDS CLEAR AND WARM SHADOWS, INVALUABLE IN BUILDINGS	USEFUL IN GEOLOGY
INDIAN INK	BRITISH INK	LAMP BLACK	IVORY BLACK	BLUE BLACK	BISTRE
					
UNIVERSALLY USED FOR DRAWING THE OUTLINES OF PLANS &c.	WASHES LESS STREAKY THAN INDIAN INK	BROWN TINT COVERS UNDERLAY OF COLOR	HIGHEST AND MOST TRANSPARENT	OF A WEAK BODY, SUITED FOR GENERAL MIXED TINTS	WASHES WELL AND USED FOR SHADOWS IN ARCHITECTURAL TINTS
NEUTRAL TINT IN CAKE	NEUTRAL TINT	SHADOW COLOUR	PAYNE'S GREY	BROWN Madder	INDELLIBLE BROWN INK
					
A COMPOUND SHADOW COLOUR	INDIGO, IND. RED & IND. INK		MORE ULTRA THAN NEUTRAL TINT	WITH COBALT OR FRENCH BLUE MAKES GOOD GREYS	USED WITH A PENCIL FOR ARCHITECTURAL DETAILS

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